Comments of Public Service Company of New Hampshire d/b/a Eversource Energy

on

EPA's Statement of Substantial New Questions for Public Comment on

Draft National Pollutant Discharge Elimination System Permit

No. NH 0001465

for

Merrimack Station

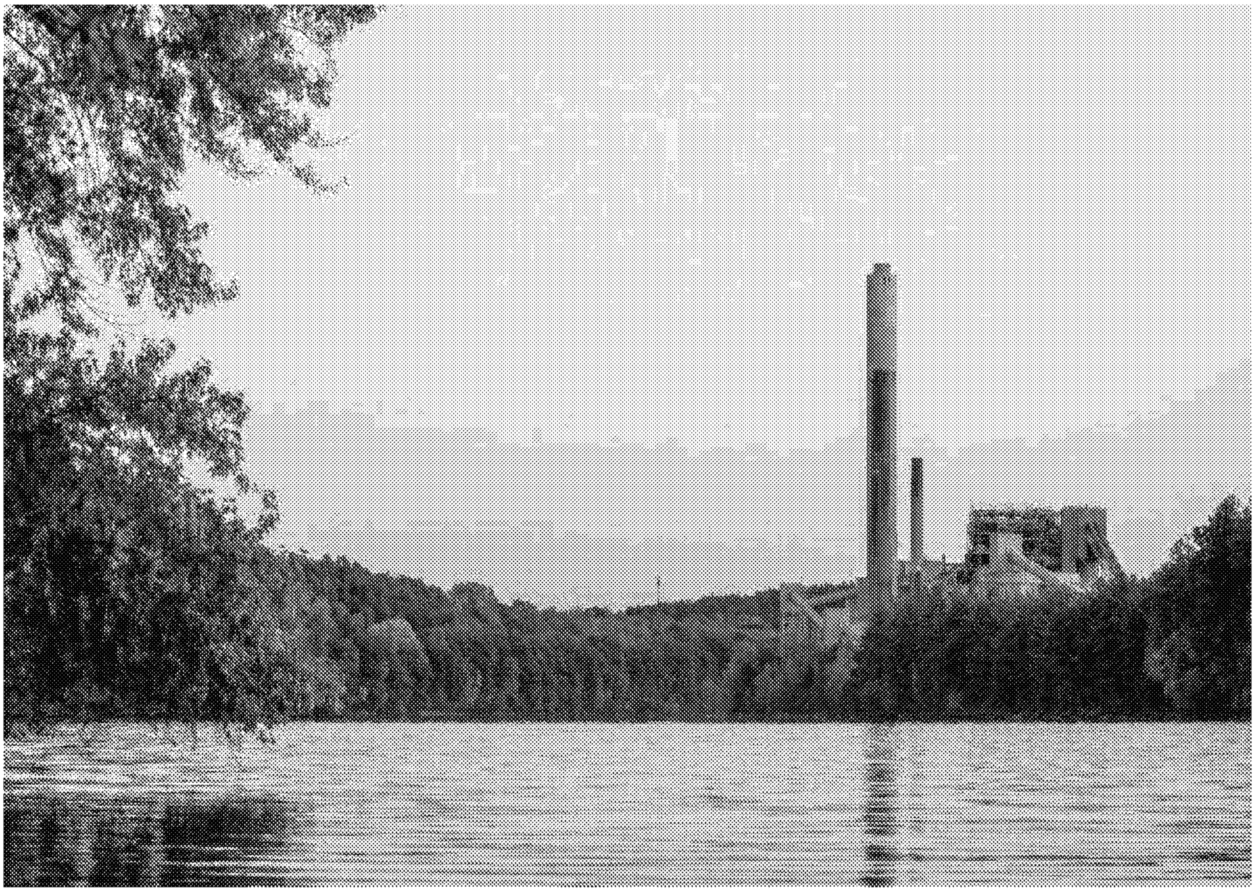

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TABLE OF CONTENTS

Page

SUPPORTING DOCUMENTS (EXHIBITS)

1. Enercon Services, Inc., Response to Environmental Protection Agency's Statement of Substantial New Questions for Public Comment (Dec. 2017).

2. Normandeau Associates, Inc., Evaluation of the Entrainment Reduction Performance of a 3-mm Wedgewire Screen at Merrimack Station (Dec. 2017).

3. Normandeau Associates, Inc., 2012-2013 Data Supplement to the Merrimack Station Fisheries Survey Analysis of 1972-2011 Catch Data (Dec. 2017).

4. Normandeau Associates, Inc., Response to EPA's "Statement of Substantial New Questions and Possible New Conditions" (Nov. 2017).

5. Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Analysis of Merrimack Station Fisheries Survey Data for 2010-2013 (Dec. 2017).

6. Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Response to EPA's "Statement of Substantial New Questions for Public Comment" (Dec. 2017).

7. Dr. Terry Richardson, AST Environmental, The Asian clam (*Corbicula Fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Nov. 2017).

8. Dr. Robert F. McMahon, Review of the Asian clam (*Corbicula Fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Dec. 2017).

9. U.S. EPA Region 1, Clean Water Act NPDES Permitting Decisions for Thermal Discharge and Cooling Water Intake from Kendall Station in Cambridge, MA, 316(a) and (b) Determination Document (June 8, 2004).

10. Electric Power Research Institute, Thermal Toxicity Literature Evaluation, Report No. 1023095, Palo Alto, CA (2011).

11. U.S. EPA, Region 1, Draft NPDES Permit No. MA0005339 for Mount Tom Generating Company, LLC (April 11, 2014).

12. U.S. EPA, Draft Quality Assurance Project Plan-"Qualifying the density of Asian clams (*Corbicula fluminea*) within and beyond the influence of the thermal discharge of a power plant" (2015).

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16. Letter from Jim Hanlon, Director, Office of Wastewater Management, to Water Division Directors Regions 1-10 (June 7, 2010).

17. NERA Economic Consulting, Economic Evaluation of Two Entrainment Reduction Technologies at Merrimack Station (Dec. 2017).

18. Memorandum from Enercon Services, Inc. to National Economic Research Associates, Technical Memorandum to Document Technology Cost Inputs for Merrimack Station (Dec. 13, 2017).

19. Normandeau Associates, Inc., Biological Benefit Evaluation of Entrainment Reducing Technologies at Merrimack Station (Dec. 11, 2017).

20. A.Y. Fedorenko, Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia, CANADIAN MANUSCRIPT REPORT OF FISHERIES AND AQUATIC SCIENCES (1991).

21. Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Division, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1975).

22. Permit No. NH0001465, Response to Comments (June 24, 1992).

23. U.S. EPA, Region 1, NPDES Permit No. NH0001601 and associated Fact Sheet for Newington Station (Sept. 30, 1993).

24. Utility Water Act Group, Comments of the Utility Water Act Group (UWAG) on EPA's Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (40 C.F.R. Part 423), Docket ID Nos. EPA-HQ-OW-2009-0819 and EPA-HQ-RCRA-2013-0209 (Sept. 20, 2013).

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No. NH 0001465 for Merrimack Station

I. Introduction

Public Service Company of New Hampshire d/b/a Eversource Energy ("PSNH" or the "Company") submits these comments to the U.S. Environmental Protection Agency's ("EPA") Statement of Substantial New Questions for Public Comment ("Statement") concerning the draft National Pollutant Discharge Elimination System ("NPDES") permit for PSNH's Merrimack Station, Permit No. NH 0001465.[1] These comments are in addition to PSNH's comments submitted on February 28, 2012, and August 18, 2014, concerning EPA's Draft Permit issued on September 29, 2011 ("2011 Draft Permit") and its Revised Draft Permit issued on April 18, 2014 ("2014 Draft Permit") (collectively, "Draft Permit").[2] PSNH adopts and incorporates its earlier comments by reference, as they provide much of the background to the Statement itself and are essential to a full understanding of the issues presented by the Draft Permit.[3]

Through its more than forty-five (45) years of biological monitoring, reporting and analysis of Merrimack Station's ("Station") potential impacts to the Merrimack River and its fisheries, PSNH has demonstrated effluent limitations proposed for the control of the thermal

[1] *See* Document AR-1534 of Region 1's compiled administrative record for this Draft Permit, available at https://www.epa.gov/npdes-permits/merrimack-station-administrative-record. Hereinafter, references to the agency's administrative record will be cited as "AR-XXX."

[2] *See* AR-846; AR-1215; AR-609; AR-1136.

[3] To the extent any of these earlier PSNH comments conflict with the comments set out herein, the comments in this submission control.

component of the facility discharge are more stringent than necessary to assure the protection and propagation of the balanced, indigenous population ("BIP") of fish, shellfish, and wildlife in Hooksett Pool, and, furthermore, that continuation of the Station's Clean Water Act ("CWA") § 316(a) variance will assure the protection and propagation of Hooksett Pool's BIP. Additional data and analyses of the Hooksett Pool fish and macroinvertebrate communities undertaken since issuance of the 2011 Draft Permit compel the same conclusion—Merrimack Station's thermal discharge has not caused appreciable harm.

Since submitting its 2012 comments, PSNH has continued its evaluation of potential cooling water intake structure ("CWIS") technologies to satisfy the CWA § 316(b) best technology available ("BTA") standard in light of EPA's 2014 final rule for existing electric generating plants and factories ("final § 316(b) rule").[4] PSNH maintains that existing operations and CWIS technologies at Merrimack Station constitute BTA because of the *de minimis* levels of impingement and entrainment at the facility and because EPA implicitly acknowledged in its final § 316(b) rule that facilities with a three-year average actual intake flow ("AIF") below 125 million gallons per day ("MGD") are not required to address entrainment, absent extenuating circumstances (which do not exist at Merrimack Station). Nevertheless, PSNH recently commissioned an in-river pilot study to assess the effectiveness of wedgewire screens to address entrainment. The results of the in-river pilot study conducted during the peak entrainment period and with test parameters representative of a conceptual wedgewire half-screen (hereinafter "wedgewire screens") design show an 89% entrainment reduction.[5] The study confirms that

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[4] *See* 79 Fed. Reg. 48,300 (Aug. 15, 2014) (codified at 40 C.F.R. pts. 122 and 125).

[5] *See* Enercon Services, Inc., Response to Environmental Protection Agency's Statement of Substantial New Questions for Public Comment at 7 (Dec. 2017); Normandeau Associates, Inc., Evaluation of the Entrainment Reduction Performance of a 3-mm Wedgewire Screen at Merrimack Station at 18-19 (Dec. 2017). Hereinafter, references to these documents will be cited as "Enercon 2017 Comments" and "Normandeau 2017 Wedgewire Report," respectively. These reports are attached hereto as Exhibits 1 and 2.

operation of wedgewire screens during the peak entrainment period—between April 1st and July 31st—provides entrainment benefits comparable to closed cycle cooling ("CCC") with substantially less air emissions, less power generation losses, no water consumption issues, and at a dramatically reduced cost.[6] In addition to the fact that the new final § 316(b) rule requires EPA to reconsider its prior determinations in the Draft Permit, the results of the pilot study and additional analyses submitted by PSNH with these comments further demonstrate that EPA's determination that CCC is required during the months of April through August under § 316(b) is arbitrary and capricious.

The following comments address the new information submitted since the 2011 Draft Permit and specifically respond to the issues and questions raised by EPA's Statement concerning EPA's § 316(a) and (b) determinations, as well as the discussions and queries regarding how the agency should regulate flue gas desulfurization ("FGD") wastewater, bottom ash transport water ("BATW"), nonchemical metal cleaning wastewater ("NCMCW"), as well as other wastewater streams in light of the 2015 national effluent limitation guidelines for the steam electric power generating point source category ("NELGs"),[7] including the agency's recent decision to reconsider certain aspects of the 2015 rulemaking.[8] The comments are organized according to the issues identified by EPA in its Statement. Part II of these comments addresses EPA's questions concerning the application of § 316(a) and New Hampshire Water Quality Standards to the Merrimack Station Permit. Part III addresses EPA's questions concerning the Draft Permit's requirements for CWISs under § 316(b). Part IV addresses issues with EPA's proposed compliance schedules. And, Part V addresses EPA's questions concerning new

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[6] Although, as explained later in these comments, the ratio of costs compared to relative benefits of wedgewire screens still fails established § 316(b) thresholds.

[7] *See* 80 Fed. Reg. 67,838 (Nov. 3, 2015) (codified at 40 C.F.R pt. 423).

[8] *See, e.g.,* 82 Fed. Reg. 43,494 (Sept. 18, 2017) (to be codified at 40 C.F.R. pt. 423).

technology-based standards for FGD wastewater, BATW, and NCMCW, as well as the remaining issues presented in the Statement. As explained herein, EPA must: (1) reconsider the requirements of the 2011 Draft Permit and its denial of PSNH's 316(a) variance, and establish reasonable limits through a lawful and proper process based on substantive and scientific facts; (2) render a § 316(b) BTA determination in accordance with the requirements of the final § 316(b) rule that concludes existing CWIS technologies and operations at Merrimack Station are sufficient; and (3) incorporate into the NPDES permit for the facility the provisions of the 2015 NELGs EPA will not reconsider, including a decision that NCMCWs will be regulated as they have been historically at Merrimack Station.

A. Standard of Review

EPA's proposed NPDES permit for Merrimack Station is fatally flawed, lacks factual support in the record, and has no basis in law. As discussed more extensively in PSNH's 2012 and 2014 Comments, EPA's Draft Permit is based on its erroneous application of and determinations under the CWA.[9] Specifically, § 316(a) of the CWA requires EPA to ensure that any point source discharger's thermal component of its effluent has not caused, and is not causing, appreciable harm to the BIP of the body of water into which the discharge is made.[10] Section 316(b) similarly requires EPA to ensure that CWISs are located, designed, and constructed in such a way as to minimize impingement and entrainment of biological organisms in the body of water from which cooling water is withdrawn.[11] Additionally, CWA § 402 authorizes EPA to establish case-by-case technology based effluent limitations pursuant to its

[9] *See* AR-846; AR-1215.

[10] 33 U.S.C. § 1325(a) (2012).

[11] 33 U.S.C. § 1325(b).

best professional judgment ("BPJ") only when national effluent limitation guidelines have not been promulgated or are inapplicable.[12]

At each step in its Draft Permit, EPA failed to establish a rational or reasonable basis for its proposed permit requirements. As such, they are "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with the law."[13] As is made clear by these comments, EPA's current Draft Permit contains limits and requirements that are based on EPA's arbitrary and capricious application of the law and are not supported by the record. EPA simply has not "fully [explained] its course of inquiry, its analysis, and its reasoning."[14]

A court will review EPA's factual permit determinations under the Administrative Procedure Act's arbitrary and capricious standard.[15] The APA requires the reviewing court to "hold unlawful and set aside agency action, findings, and conclusions found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with [the] law."[16] An agency decision is arbitrary and capricious if "the agency has relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation of its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency

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[12] 33 U.S.C. § 1344.

[13] 5 U.S.C. § 706(2)(A).

[14] *See Reynolds Metals Co. v. EPA*, 760 F.2d 549, 559 (4th Cir. 1985) (quoting *Tanner's Council of Am., Inc. v. Train*, 540 F.2d 1188, 1191 (4th Cir. 1976)).

[15] *Pamlico-Tar River Found. v. U.S. Army Corps of Eng'rs*, 329 F. Supp. 2d 600, 612 (E.D.N.C. 2004) ("agency action under the CWA is reviewed under the arbitrary and capricious standard"); *c.f., Conservation Law Found. v. Fed. Highway Admin.*, 827 F. Supp. 871, 885 (D.R.I. 1993) *aff'd*, 24 F.3d 1465 (1st Cir. 1994) ("under the APA standard, courts reviewing permit Section 404 decisions must determine whether the Corps' action was 'arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.'") (citing 5 U.S.C. § 706(2)(A)); *Hough v. Marsh*, 557 F. Supp. 74, 81 (D. Mass. 1982).

[16] *Alliance to Save the Mattaponi v. U.S. Army Corps of Eng'rs*, 606 F. Supp. 2d 121, 127 (D.D.C. 2009) (citing 5 U.S.C. § 706(2)(A)).

expertise."[17] Questions of law will be determined by a two-step process established by the U.S. Supreme Court.[18]

B. Relevance of the Divestiture Proceedings and Sale of Merrimack Station

On October 11, 2017, PSNH entered into a purchase and sale agreement with Granite Shore Power LLC ("Granite Shore") for the purchase of PSNH's thermal generating plants, including Merrimack Station, as part of the New Hampshire Public Utilities Commission's ("NHPUC") divestiture process.[19] As currently structured, GSP Merrimack LLC, a wholly owned subsidiary of Granite Shore, will purchase Merrimack Station and become its new owner likely before the end of December 2017. Granite Shore has informed PSNH there are no current plans to change either the operations of Merrimack Station or the specific operational personnel with regard to management of environmental matters following the closing. For instance, Granite Shore has informed PSNH that, in response to the capacity utilization questions in EPA's

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[17] *Id.* (citing *Motor Vehicle Mfrs. Ass'n v. State Farm Mut. Auto. Ins. Co.*, 463 U.S. 29, 43 (1983)).

[18] *See Defenders of Wildlife v. Browner*, 191 F.3d 1159, 1162 (9th Cir. 1999), *opinion amended on denial of reh'g*, 197 F.3d 1035 (9th Cir. 1999):

> [T]he Supreme Court devised a two-step process for reviewing an administrative agency's interpretation of a statute that it administers. . . . Under the first step, we employ "traditional tools of statutory construction" to determine whether Congress has expressed its intent unambiguously on the question before the court. . . . "If the intent of Congress is clear, that is the end of the matter; for the court, as well as the agency, must give effect to the unambiguously expressed intent of Congress." If, instead, Congress has left a gap for the administrative agency to fill, we proceed to step two. At step two, we must uphold the administrative regulation unless it is "arbitrary, capricious, or manifestly contrary to the statute."

(internal quotations omitted) (citing *Chevron U.S.A. Inc. v. Natural Res. Defense Council, Inc.*, 467 U.S. 837, 842-44 (1984)).

[19] In RSA 369-B:3a (2015), the New Hampshire Legislature found that divestiture of PSNH's generation plants is in the public interest, subject to the NHPUC's finding that it is in the economic interest of retail customers of PSNH. In 2015, PSNH and numerous other parties entered into a comprehensive settlement agreement (the "2015 Settlement Agreement") resolving myriad issues and setting forth the requirement and methodology for PSNH to divest all of its electric generating assets. By its Order No. 25,920 dated July 1, 2016, the NHPUC approved the 2015 Settlement Agreement. In that Order, the NHPUC also approved a companion "2016 Litigation Settlement" which held that "The Settling Parties and [NHPUC] Staff agree that in light of the economic benefits reasonably expected from divestiture, the prompt divestiture of PSNH's generation assets is in the economic interest of retail customers of PSNH." Order No. 25,920 at 44. In its Order No 25,920, the NHPUC specifically stated that "the 2015 Settlement Agreement and 2016 Litigation Settlement serve the public interest." Order No. 25,920 at 67.

Statement,[20] Granite Shore is not willing to have, or desirous of having, Merrimack Station's operations restricted, including based on capacity utilization.

In its Statement, EPA invites comment regarding whether the divestiture proceedings for Merrimack Station should affect any of the Final Permit's limits, and if so, how it should affect them. As discussed in these comments, PSNH anticipates the need for a dialogue between EPA and the new owner concerning issues that will require resolution after the comment period, including, for example, the new owner's preferences with respect to the FGD and BATW wastewater streams. As EPA notes in its Statement, on June 6, 2017, EPA issued a proposed rule titled, "Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category."[21] In it, EPA proposed for public notice and comment the stay of the compliance dates for the BAT limitations and pretreatment standards ("PSES") for the following wastewater streams: fly ash transport water, BATW, FGD wastewater, flue gas mercury control wastewater, and gasification wastewater. EPA published its final version of the June 6, 2017 proposed rule in the Federal Register on September 18, 2017.[22] EPA also postponed the earliest BAT and PSES compliance date for BATW and FGD wastewater to November 1, 2020, because the agency intends to initiate a new rulemaking to potentially revise the effluent limitations for these wastewater streams and "projects it will take approximately three years to propose and finalize a new rule (Fall 2020)."[23] These developments no doubt may affect how the new owner wishes to proceed

[20] AR-1534 at 35; 68.

[21] 82 Fed. Reg. 26,017 (June 6, 2017) (to be codified at 40 C.F.R. pt. 423).

[22] *Id.*

[23] 82 Fed. Reg. at 43,498.

with respect to BATW and FGD wastewater permitting requirements, including the Voluntary Incentives Program ("VIP") set out in the 2015 NELGs for the regulation of FGD wastewater.

II. Forty-Five Years of Comprehensive Study Concerning CWA § 316(a) and New Hampshire Water Quality Standards Demonstrates the Absence of Appreciable Harm to the Hooksett Pool BIP and that PSNH's Existing Thermal Variance Should Be Extended

Section IV, Part B. of EPA's Statement requests additional public comment concerning PSNH's CWA § 316(a) variance application and EPA's application of New Hampshire water quality standards concerning Merrimack Station's thermal effects on the Hooksett Pool portion of the Merrimack River.[24] As discussed below, the information submitted by PSNH since its 2012 comments and now in response to the specific questions in EPA's Statement corroborates that Merrimack Station's thermal discharge is not causing appreciable harm to the BIP of Hooksett Pool. These comments respond to the Statement's specific questions concerning the new thermal information and data submitted by PSNH since 2011, and EPA's questions concerning the significance of the Asian clam, a ubiquitous invasive species found throughout the United States and spreading throughout New Hampshire. As explained below, Hooksett Pool hosts a successful BIP unharmed by Merrimack Station's thermal influence or the Asian clam. PSNH urges EPA to use this opportunity presented by its Statement to reconsider its arbitrary and capricious denial of PSNH's 316(a) variance request in 2011. As discussed below, the data submitted to date, as corroborated by the new data and analyses submitted with these comments, compel a finding that PSNH has more than met its burden of showing its operations have not caused and are not causing appreciable harm to the BIP of Hooksett Pool.

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[24] AR-1534 at 40.

A. Relevant Legal Standard

Under CWA § 301, because Merrimack Station is a discharger of heat, it must satisfy both technology based standards and water quality standards, or obtain a variance from these standards under CWA § 316(a).[25] With respect to technology based standards, CWA § 301 requires that these standards reflect the "best available technology economically achievable . . . which will result in reasonable further progress toward the national goal of eliminating the discharge of all pollutants."[26] Additionally, CWA § 301(b) places more stringent requirements on a discharger if needed to meet state water quality standards.[27] However, "a basic technological approach to water quality control [cannot] be applied in the same manner to the discharge of heat as to other pollutants."[28] Thus, § 316(a) of the CWA authorizes EPA to grant variances for thermal discharges from "any point source otherwise subject to the provisions of section [301] . . . of [the CWA]."[29] Merrimack Station has in the past demonstrated that a § 316(a) variance from the technology based and water quality standards was appropriate; therefore, its current permit contains thermal discharge requirements based on a § 316(a) variance.[30]

CWA § 316(a) allows EPA to grant a variance from the § 301 standards described above whenever:

> [T]he owner or operator . . . can demonstrate . . . that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to assure the protection and

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[25] 33 U.S.C. § 1311.

[26] *Id.* at § 1311(b)(2)(A).

[27] *Id.*

[28] *See, e.g.*, *Appalachian Power Co. v. Train*, 545 F.2d 1351, 1356 (4th Cir. 1976).

[29] 33 U.S.C. § 1326(a).

[30] AR-236.

> propagation of a balanced, indigenous population of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . . .[31]

EPA may instead impose alternative effluent limitations on thermal discharges "that will assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on that body of water."[32] BIP is not defined by statute or regulations; however, "balanced, indigenous community" (which the regulations state is synonymous with BIP) is defined as:

> [A] biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications.[33]

As explained by EPA in its Fact Sheet for the 2011 Draft Permit, non-indigenous species that historically were not present in Hooksett Pool but appeared later in time should not be included in analysis of the BIP, except to consider how their presence has affected, if at all, the balanced indigenous community.[34]

The Environmental Appeals Board ("EAB") has summarized the § 316(a) variance determination process as follows:

> [R]eading CWA sections 301 and 316(a) together, the statute and regulations in effect establish a three- (and sometimes four-) step framework for obtaining a variance: (1) the Agency must determine what the applicable technology and WQS-based

[31] 33 U.S.C. § 1326(a).

[32] *Id.*

[33] 40 C.F.R. § 125.71(c) (2017).

[34] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

> limitations should be for a given permit; (2) the applicant must demonstrate that these otherwise applicable effluent limitations are more stringent than necessary to assure the protection and propagation of the BIP; (3) the applicant must demonstrate that its proposed variance will assure the protection and propagation of the BIP; and (4) in those cases where the applicant meets step 2 but not step 3, the Agency may impose a variance it concludes does assure the protection and propagation of the BIP.[35]

EPA has promulgated regulations describing the factors, criteria, and standards for the establishment of effluent standards issued under a § 316(a) variance.[36] These regulations restate the requirements of § 316(a) and require the applicant to demonstrate that an alternative effluent limitation will "assure the protection and propagation of a balanced, indigenous community . . . ."[37] For existing sources, this demonstration is based on the "absence of prior appreciable harm."[38]

Existing sources can show that there has been no appreciable harm in one of two ways: either by demonstrating that "no appreciable harm has resulted from the normal component of the discharge taking into account the interaction of such thermal component with other pollutants and the additive effect of other thermal sources to [the BIP]," *i.e.*, a retrospective demonstration,[39] or by demonstrating that "despite the occurrence of such previous harm, the desired alternative effluent limitations (or appropriate modification thereof) will nevertheless

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[35] *In re: Dominion Energy Brayton Point, L.L.C. (formerly USGen New England, Inc.) (Brayton Point Station)*, 12 E.A.D. 490, 500 (EAB 2006) ("*Brayton Point I*").

[36] *See* 40 C.F.R. §§ 125.70-73.

[37] *Id.* at § 125.73(a).

[38] *Id.* at § 125.73(c)(1).

[39] *Id.* at § 125.73(c)(1)(i). In such a retrospective analysis, the existing discharger must demonstrate that it has appropriately evaluated the typical indicators of long-term thermal effects and determined there is no indication of "appreciable" thermal impacts on the BIP attributable to the discharge in question. *See Brayton Point I,* 12 E.A.D. at 553 (when looking at trends, § 316(a) determination only assigns to station those effects actually caused by station). Because ecosystems are dynamic and "changes occur continually due to natural processes and stresses," the focus of a retrospective § 316(a) demonstration's long-term assessment of fish must be on those changes that are reasonably, but definitively, attributable to a particular thermal discharge, not simply on changes alone. *In re Pub. Serv. Co. of Ind., Inc. (Wabash River Generating Station, Cayuga Generating Station)*, NPDES Appeal No. 78-6, 1979 WL 22675, at *7, 1 E.A.D. 590, 601 (EAB Nov. 29, 1979) ("*Wabash*").

assure the protection and propagation of [the BIP]," *i.e.*, a prospective demonstration.[40] PSNH has demonstrated that no appreciable harm has resulted from its prior thermal discharges through a retrospective analysis.

"Appreciable harm" is not defined in EPA's regulations. However, EPA has attempted to give some meaning to the term in case law and guidance documents. In a 1974 guidance document for § 316(a), EPA describes "appreciable harm" as damage to the BIP resulting in a "substantial increase" of nuisance or heat tolerant species, a "substantial decrease" in formerly indigenous species, a "substantial" reduction of trophic structure, "reduction of the successful completion of life cycles of indigenous species," an "unaesthetic appearance, odor or taste of the waters," and "elimination of an established or potential economic or recreational use of the waters."[41] Importantly, EPA explains that "[i]t is not intended that every change in flora and fauna should be considered appreciable harm."[42]

Importantly, not all levels of impacts to a fish community rise to "appreciable harm." In fact, EPA's own guidance plainly states that some level of impact is acceptable.[43] Both the EAB

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[40] *See Brayton Point I*, 12 E.A.D. at 553 (citing 40 C.F.R. §125.73(c)(1)(i)-(ii)).

[41] *See* AR-1195 at 23.

[42] *Id.* Additionally, in *Brayton Point I*, 12 E.A.D. at 565 n.118, the EAB included a footnote stating that "[w]e note that the word 'measurable' is a synonym for 'appreciable.'" (citing The Doubleday Roget's Thesaurus in Dictionary Form 31 (Sidney I. Landau & Ronald J. Bogus, eds., 1977)). In response to comments on a § 316(a) variance request, EPA provided that a thermal discharge must cause a significant delay in the recovery of a BIP of fish, shellfish, and wildlife to qualify as appreciable harm. *See* AR-561 at III-8. Moreover, in response to comments regarding Brayton Point's final NPDES permit, EPA provided that "even significant adverse effects on a few species do not necessarily require a finding of appreciable harm to the BIP that would preclude a § 316(a) variance," EPA agreed "to the extent that the commenter is saying that even significant adverse effects on a few species might not create a 100 percent inviolate requirement that no § 316(a) variance could be issued." *Id.* at III-35; *Brayton Point I*, 12 E.A.D. at 575 (providing that a permitting authority should select a temperature that "represent[s] an acceptable level of impact but [does] not represent a zero impact temperature") (citation omitted); *In re Dominion Energy Brayton Point, L.L.C. (formerly USGen New England, Inc.)*, 13 E.A.D. 407 (EAB 2007) (providing that an applicant is not required to show "no effects" to prove no prior appreciable harm).

[43] *See, e.g.*, AR-1180 at 23 (reductions in macroinvertebrate community diversity and standing crop "*may* be cause for denial of a 316(a) waiver" but applicant can still otherwise show no prior appreciable harm).

and EPA Region 1 have confirmed this interpretation.[44] In sum, an existing discharger is entitled to a § 316(a) variance if, as noted above, it shows it has evaluated the typical indicators of long-term thermal effects (*e.g.*, abundance, diversity, community composition) in an appropriate manner, and determined there is no reasonable indication of thermal impacts attributable to the discharge in question.

PSNH has demonstrated that no appreciable harm has resulted from thermal discharges from Merrimack Station. Furthermore, the new data confirms that continuation of PSNH's § 316(a) variance at Merrimack Station will continue to assure the protection and propagation of the BIP; therefore, EPA should renew the variance.

B. The Studies PSNH and its Consultants Have Submitted from 1969 through 2017 Demonstrate the Absence of Appreciable Harm and Support PSNH's Request for Renewal of Its § 316(a) Variance

To understand the context of the new submissions—which corroborate the absence of any appreciable harm to the Hooksett Pool BIP—it is important first to briefly consider PSNH's numerous submissions to EPA in support of its permit and renewal applications. Before issuance of the 2011 Draft Permit, PSNH provided EPA with the following comprehensive studies spanning from 1969 through 2010:

- The Effects of Thermal Releases on the Ecology of the Merrimack River (Normandeau 1969);[45]
- The Effects of Thermal Releases on the Ecology of the Merrimack River - Supplemental Report No. 1 (Normandeau 1970);[46]

[44] *See, e.g.*, *Wabash*, 1 E.A.D. at *7 (some level of harm to individual species is acceptable where community as whole remains relatively stable); *Brayton Point I*, 12 E.A.D. at 574 n.138, 139 (upholding EPA Region 1's analysis, which accommodates adverse effects but not to the extent that they would interfere with protection and propagation of BIP).

[45] AR-181.

[46] AR-285.

- Merrimack River Monitoring Program: A Report for the Study Period 1971 (Normandeau 1972);[47]

- Merrimack River Monitoring Program: A Report for the Study Period 1972 (Normandeau 1973a);[48]

- Merrimack River: Temperature and Dissolved Oxygen Studies 1972 (Normandeau 1973b);[49]

- Merrimack River Monitoring Program: A Report for the Study Period 1973 (Normandeau 1974);[50]

- Merrimack River Monitoring Program 1974 (Normandeau 1975a);[51]

- Merrimack River Ecological Studies: Impacts Noted to Date; Current Status and Future Goals of Anadromous Fish Restoration Efforts; and Possible Interactions Between Merrimack Station and Anadromous Fishes (Normandeau 1975b);[52]

- Merrimack River Monitoring Program 1975 (Normandeau 1976a);[53]

- Merrimack River Anadromous Fisheries Investigations: Annual Report for 1976 (Normandeau 1976b);[54]

- Further Assessment of the Effectiveness of an Oil Containment Boom in Confining the Merrimack Generating Station Discharge to the West Bank of the River (Normandeau 1976c);[55]

- Merrimack River Monitoring Program 1976 (Normandeau 1977a);[56]

- Final Report: Merrimack River Anadromous Fisheries Investigations 1975-1976 (Normandeau 1977b);[57]

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[47] AR-1141.

[48] AR-1150.

[49] AR-1149.

[50] AR-1148.

[51] AR-1147.

[52] AR-1146.

[53] AR-1145.

[54] AR-1155.

[55] AR-1151.

[56] AR-1159.

[57] AR-1156.

- Merrimack River Thermal Dilution Study 1978 (Normandeau 1978);[58]

- Merrimack River Monitoring Program 1978 (Normandeau 1979a);[59]

- Merrimack River Monitoring Program: Summary Report (Normandeau 1979b);[60]

- Merrimack River Anadromous Fisheries Investigation 1978 (Normandeau 1979c);[61]

- Phase I Preliminary Report – Information Available Related to Effects of Thermal Discharge at Merrimack Station on Anadromous and Indigenous Fish of the Merrimack River (Stetson-Harza 1993);[62]

- Merrimack Station: Thermal Discharge Modeling Study (Normandeau 1996);[63]

- Merrimack Station (Bow) Fisheries Study (Normandeau 1997);[64]

- Merrimack Station Thermal Discharge Effects on Downstream Salmon Smolt Migration (Normandeau 2006a);[65]

- Merrimack Station Fisheries Survey Analysis of 1967 through 2005 Catch and Habitat Data (Normandeau 2007a);[66]

- Entrainment and Impingement Studies Performed at Merrimack Generating Station from June 2005 through June 2007 (Normandeau 2007b);[67]

- A Probabilistic Thermal Model of the Merrimack River Downstream of Merrimack Station (Normandeau 2007c);[68]

- Biocharacteristics of Yellow Perch and White Sucker Populations in Hooksett Pool of the Merrimack River (Normandeau 2009a);[69]

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58 AR-1184.

59 AR-198.

60 AR-364.

61 AR-1203.

62 AR-191.

63 AR-184.

64 AR-201.

65 AR-7.

66 AR-11.

67 AR-2.

68 AR-10.

- Biological Performance of Intake Screen Alternatives to Reduce Annual Impingement Mortality and Entrainment at Merrimack Station (Normandeau 2009b);[70] and

- Modeling the Thermal Plume in the Merrimack River from the Merrimack Station Discharge (ASA 2010)[71].

In 2012, in addition to PSNH's own comments concerning the 2011 Draft Permit, Normandeau Associates, Inc. ("Normandeau") submitted extensive Comments on the Draft Permit demonstrating the absence of appreciable harm to the BIP of Hooksett Pool and identifying numerous errors in EPA's § 316(a) determination.[72] Also, as part of PSNH's Comments to the 2011 Draft Permit, PSNH submitted the following reports and analyses related to the fish and macroinvertebrate communities and water quality of the Hooksett Pool substantiating this conclusion, including:

- Merrimack Station Fisheries Survey Analysis of the 1972-2011 Catch Data (Normandeau 2011a);[73]

- Historic Water Quality and Selected Biological Conditions of the Upper Merrimack River, New Hampshire (Normandeau 2011b);[74]

- Changes in the Composition of the Fish Aggregation in Black Rock Pool in the Vicinity of Cromby Generating Station from 1970 to 2007 (Normandeau 2011c);[75]

- Quantification of the Physical Habitat within Garvins, Hooksett, and Amoskeag Pools of the Merrimack River (Normandeau 2011d);[76] and

- Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station (Normandeau 2012a).[77]

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[69] AR-12.

[70] AR-246.

[71] AR-99.

[72] AR-872.

[73] AR-1153.

[74] AR-1172.

[75] AR-1171.

[76] AR-1173.

As explained in PSNH's 2012 Comments, these studies demonstrate through multiple, different methods that Hooksett Pool is a BIP and the thermal discharge of Merrimack Station has not caused appreciable harm.[78] They include a comparison of fish species in Hooksett Pool for an over forty year period, an analysis of the biocharacteristics of fish species in Hooksett, Garvins, and Amoskoeg Pools, and examination of the benthic macroinvertebrate communities in Hooksett and Garvins Pools. These studies were performed consistent with EPA's own guidance[79] and often at the direction and under the oversight of EPA, New Hampshire Department of Environmental Services ("NHDES"), the Federal Energy Regulatory Commission, the U.S. Fish and Wildlife Service, the New Hampshire Department of Fish and Game, and the Merrimack Station Technical Advisory Committee ("TAC").[80] These studies demonstrate the current aquatic community in the Hooksett Pool meets all the characteristics of a BIP—namely, Hooksett Pool is characterized by (1) diversity at all trophic levels, (2) the capacity to sustain itself through cyclic seasonal changes, (3) the presence of necessary food chain species, and (4) non-domination by pollution-tolerant species.[81] Further, PSNH has met its burden of showing the operation of Merrimack Station has not caused appreciable harm to the Hooksett Pool BIP.[82]

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[77] AR-1174. The majority of these reports focus on the Merrimack River fish community, in accordance with the well-established biological assessment approach of using fish assemblages as indicators of overall ecological condition. EPA's own technical framework document for the development and implementation of large river bioassessment programs describes the many advantages of using fish assemblages as a direct measure of biological condition relative to biological integrity, noting that fish are relatively long-lived, mobile, feed at every trophic level (*e.g.*, herbivores, omnivores, and predators), and can be relatively easy to identify to species. *See, e.g.,* AR-1164 at 3-4.

[78] *See* AR-846 at 7-60.

[79] *See* AR-1195 at 46-62.

[80] The TAC is the group of fish and ecosystem experts from various federal and state agencies established under the current NPDES permit to advise EPA and NHDES.

[81] *See* AR-846 at 17-34; 40 C.F.R. §125.71(c).

[82] *See* AR-846 at 36-59.

After submitting its 2012 Comments, PSNH continued its analyses and supplied additional technical documentation and temperature data supporting its § 316(a) variance request, including the following:

- Letter from Linda T. Landis to Mr. Eric P. Nelson dated February 29, 2016 re: Response to November 30, 2015 EPA Region 1 CWA Section 308 Information Request Merrimack Station Temperature Data (including more recent and more detailed temperature data from 2002 through 2015, including the period after PSNH's completion of the Clean Air Project that is more representative of current plant operations);[83]

- Review of technical documents related to NPDES Permitting Determinations for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station, Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc. (LWB Feb. 2016);[84]

- Response to USEPA CWA § 308 Letter by Enercon and Normandeau (Enercon/Normandeau Feb. 2016);[85]

- CORMIX Thermal Plume Modeling Technical Report, PSNH Merrimack Station Units 1 & 2 Bow, New Hampshire, Enercon Services, Inc. (Dec. 2016);[86]

- Influence of Merrimack Station's Thermal Plume on Habitat Utilization by Fish Species Present in Lower Hooksett Pool, Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc. (Dec. 2016).[87]

These submissions included analyses from Dr. Lawrence W. Barnthouse, a highly regarded scientist with a wealth of experience in § 316(a) matters. Dr. Barnthouse reviewed EPA's § 316 determination as well as the extensive reports and analyses prepared by Enercon and Normandeau.[88] After identifying several flaws underlying EPA's § 316(a) determination that Dr. Barnthouse found invalidated its conclusions, Dr. Barnthouse determined that "operation

[83] *See* AR-1299 through 1307.

[84] AR-1300.

[85] AR-1305.

[86] AR-1352, Attachment 2.

[87] *Id.*, Attachment 3.

[88] *See* AR-1300.

of Merrimack Station has caused no appreciable harm to the BIP present in the Hooksett Pool."[89] Enercon and Normandeau also provided a comprehensive analysis of the detailed temperature data supplied by PSNH for the period 2002 through 2015. When comparing the average monthly mean temperatures between the 1984 through 2001 and 2002 through 2015 periods, the 2002 through 2015 data set (the period more representative of current plant operations) yielded "equivalent or lower downstream temperatures."[90]

PSNH's December 2016 submission included expert analysis of the relevant temperature data of Merrimack Station's thermal effluent, including CORMIX thermal plume modeling that calculated average plume characteristics over the period 2006-2015 for three representative time periods: early spring (May 2 – May 8), late spring (June 9 – June 15), and mid-summer (July 29 – August 4).[91] Based on this analysis, in none of the cases examined would the thermal plume from Merrimack Station affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge.[92]

Now, with these comments, PSNH is submitting additional support for its § 316(a) variance request and in specific response to EPA's Statement, including the following:

- Normandeau Associates, Inc., 2012-2013 Data Supplement to the Merrimack Station Fisheries Survey Analysis of 1972-2011 Catch Data (Dec. 2017) ("Normandeau 2017a");[93]
- Normandeau Associates, Inc., Response to EPA's "Statement of Substantial New Questions and Possible New Conditions" (Nov. 2017) ("Normandeau 2017 Response");[94]

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[89] *Id.* at 44.

[90] AR-1305 at 3.

[91] *See* AR-1352, Attachment 3.

[92] AR-1352, Attachment 3 at i ("The survey data show that Merrimack Station's thermal discharge has had no measurable impacts on the fish community in the Hooksett Pool."). PSNH adopts and incorporates these February 2016 and December 2016 submissions as part of these comments as if fully set forth herein.

[93] This report is attached hereto as Exhibit 3.

- Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Analysis of Merrimack Station Fisheries Survey Data for 2010-2013 (Dec. 2017) ("LWB 2017 Analysis");[95]

- Lawrence W. Barnthouse, Ph. D., LWB Environmental Services, Inc., Response to EPA's "Statement of Substantial New Questions for Public Comment" (Dec. 2017) ("LWB 2017 Response");[96]

- Enercon Services, Inc., Response to Environmental Protection Agency's Statement of Substantial New Questions for Public Comment (Dec. 2017) ("Enercon 2017 Comments");[97]

- Dr. Terry Richardson, AST Environmental, The Asian clam (*Corbicula Fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Nov. 2017) ("AST Report");[98] and

- Dr. Robert F. McMahon, Review of the Asian clam (*Corbicula Fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New Hampshire (Dec. 2017) ("McMahon Review").[99]

Collectively, through decades of study and analysis, PSNH has submitted a comprehensive and scientific history of the Merrimack River and biota in the vicinity of Merrimack Station that conclusively demonstrates that Merrimack Station's thermal discharge has not caused prior appreciable harm to the fish or invertebrate communities or their representative populations. PSNH has satisfied its burden for renewal of its thermal variance. EPA has failed to meet its burden to "convincingly negate[] by outside evidence" PSNH's satisfaction of its § 316(a) burden.[100] Instead, contrary to Region 1's own previously stated

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[94] This report is attached hereto as Exhibit 4.

[95] This report is attached hereto as Exhibit 5.

[96] This report is attached hereto as Exhibit 6.

[97] This report is attached as Exhibit 1.

[98] This report is attached hereto as Exhibit 7.

[99] This report is attached hereto as Exhibit 8.

[100] *See* AR-1180 at 17.

practice,[101] EPA denied continuation of the 316(a) variance and proposed a permit that would require construction and installation of a cooling tower that cannot be economically justified by any rational cost-benefit analysis. This draconian requirement is based on speculation and error pointed out by PSNH and Normandeau in their 2012 Comments and attachments.[102] This error is further confirmed by the new data and analyses submitted by PSNH since 2012 and with these Comments—the Merrimack Station thermal discharge has not caused appreciable harm to the BIP of Hooksett Pool.

1. A Thorough Review of the Totality of the Evidence Submitted Demonstrates that the Aquatic Community Currently in the Hooksett Pool is a BIP and that No Appreciable Harm to that BIP has Resulted from Merrimack Station's Thermal Discharge

In its Statement, EPA advises it is "reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species."[103] As demonstrated in the submissions of Normandeau, Enercon and Dr. Barnthouse since the 2012 Comments, speculation based on a comparison of abstract temperature data with theoretical fish tolerance thresholds developed in laboratory studies is not only unwise but is also unnecessary. The actual data from 40+ years of intensive biological study demonstrates Hooksett Pool is a BIP and that river temperatures, short and long-term, have not caused appreciable harm to the fish community of Hooksett Pool. PSNH has met its thermal variance burden through multiple, mutually supporting analyses that, taken together, clearly demonstrate

[101] *See, e.g.,* U.S. EPA Region 1, Clean Water Act NPDES Permitting Decisions for Thermal Discharge and Cooling Water Intake from Kendall Station in Cambridge, MA, 316(a) and (b) Determination Document (June 8, 2004) ("Mirant Kendall Determination"), at 34-35 (question under § 316(a) is what informed scientific judgment would be without speculation about evidence not in record). This document is attached hereto as Exhibit 9.

[102] *See* AR-846; AR-1170.

[103] AR-1534 at 40.

an absence of harm caused by the operation of Merrimack Station. These include analyses of fish community composition, long-term trends in the abundance of representative important fish species ("RIS"), and key biological characteristics of the fish belonging to these species. Many of these analyses compared the fish community in Hooksett Pool to the communities present in the adjacent upstream (Garvins) and downstream (Amoskeag) Pools.

From 1972 through 1978, Normandeau, on behalf of PSNH and under the direction of the TAC, performed thermal and biological monitoring, including electrofish sampling, in the Hooksett Pool to characterize the river biota for the purpose of detecting potential long-term trends relating to the Station's operations.[104] It repeated the same thermal and biological monitoring and sampling program during 1995 and again during 2004, 2005, 2010, 2011, 2012, and 2013 to obtain additional annual observations of the fish communities present in the Merrimack River, including the RIS selected and approved by the TAC.[105]

The four years of sampling from 2010 through 2013 are especially relevant, because these surveys included Garvins and Amoskeag Pools as well as Hooksett Pool.[106] During all four years, samples were collected at the same 24 stations (6 in Garvins Pool, 12 in Hooksett Pool, and 6 in Amoskeag Pool), during the months of August and September. The same sampling procedures were used at every station during each of these 4 years. In addition, in 2012, spring sampling was conducted in all three Pools to obtain information concerning the spawning condition of 2 species of interest—white sucker and yellow perch—species EPA had identified

[104] *See* AR-1150; AR-1149; AR-1148; AR-1147; AR-1146; AR-1145; AR-1155; AR-1151; AR-1159; AR-1156; AR-198; AR-364; AR-1203. The full title of the Normandeau reports covering the span of 1969-2012 are provided on pages 13-16 of these comments.

[105] *See* AR-184; AR-1153; Normandeau 2017a.

[106] *See id.*

as being thermally sensitive that have declined in abundance because of Merrimack Station's thermal discharge.[107] As explained by Dr. Barnthouse:

> These surveys provide a high-quality data set for evaluating whether the operation of Merrimack Station is causing observable adverse changes in the fish community of the Hooksett Pool, as compared to communities in upstream and downstream pools. Examples of such changes would be comparatively low or high abundance of thermally sensitive fish species, anomalous values of community metrics, or impaired reproductive condition. Absence of these types of changes would indicate that the fish community in Hooksett Pool is not being affected by station operations.
>
> The fact that the surveys included both upstream and downstream pools is especially important. If only the upstream Garvins Pool had been sampled, any differences between Hooksett and Garvins Pools could be due to natural upstream-downstream gradients in physical and biological conditions, not due to Merrimack Station's thermal discharge. The existence of such gradients was recognized more than 100 years ago (e.g., Shelford 1911), and is well-established in the ecological literature (Vannote et al. 1980). According to these ecological principles, the fish communities in Garvins, Hooksett, and Amoskeag pools should be different, but should differ in ways that are consistent with the expected upstream to downstream gradient in environmental conditions. Specifically, Garvins and Amoskeag Pools should be less similar to each other than either is to Hooksett Pool. Finding that these pools are *more* similar to each other than to Hooksett Pool would indicate that Hooksett Pool deviates from the expected gradient and could be adversely affected by Merrimack Station.[108]

In his 2016 report, Dr. Barnthouse considered statistical analyses of trends data for 15 resident fish species set out in Normandeau 2011a and the report's comparisons between the fish communities present in Garvins, Hooksett, and Amoskeag Pools.[109] Similar to Normandeau's finding of no appreciable harm, Dr. Barnthouse found Merrimack Station's thermal discharge

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[107] *See id.*

[108] LWB 2017 Analysis at 1-2.

[109] AR-1300 at 16-18.

has caused no appreciable harm to the BIP of Hooksett Pool. Among his other findings supporting no appreciable harm, Dr. Barnthouse concluded:

> Taxa Richness, meaning the number of different fish species collected, has increased from 12 species collected in 1972 to 19 species collected in 2011. Except for the anomalous year 1995 when bluegill dominated the electrofishing catch, species diversity as measured by the Shannon Diversity Index has increased since the 1970s. Since environmental stress has been frequently found to decrease taxonomic richness and diversity (Rapport et al. 1985), these increases could be responses to improved water quality in the Merrimack River. They are definitely inconsistent with the expected effects of thermal stress, which would be to decrease richness and diversity. Normandeau (2011b) also found that the percent of species classified as "generalist feeders," another indicator of environmental degradation, has decreased. The percent of species classified as pollution-tolerant has varied but not noticeably changed. ***Taken together, these community-level results support a conclusion that there has been no appreciable harm to the BIP due to the operation of Merrimack Station.***[110]

Further, Dr. Barnthouse found the "most revealing results" presented in Normandeau's 2011b report to be its comparisons of the relative abundance of species and "catch-per-unit-effort" ("CPUE") between the fish communities in Garvins, Hooksett, and Amoskeag Pools.[111] Except for a few occasionally abundant species such as tessellated darter (Garvins Pool, 2010) and margined madtom (Amoskeag Pool, 2012), the most abundant species during all four years were species discussed in EPA's § 316 Determination and identified as RIS by Normandeau.[112] Within each Pool, the same species tended to dominate numerically in most or all four years.[113] All three Pools consisted of a mix of warmwater, coolwater, and warmwater/coolwater species.[114] Three coolwater species were numerically dominant in Garvins Pool, as compared to

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[110] *Id.* at 16-17 (emphasis added).

[111] *Id.* at 17.

[112] LWB 2017 Analysis at 2-4.

[113] *Id.* at 4.

[114] *Id.*

2 in Hooksett Pool and 1 in Amoskeag Pool. Although this pattern suggests a potential upstream-downstream gradient in thermal tolerance, examination of the percent contribution of coolwater species to the total catch does not support the existence of such a gradient. During the years 2010-2013, the percent contributions of coolwater fish to the total catch in Hooksett Pool is actually higher than in Garvins Pool for three of the four years.[115] Further, although no upstream-downstream trends in thermal tolerance are evident in the survey data, there is a clear trend in taxonomic composition, specifically in dominance of the fish community by members of the family Centrarchidae.[116] Centrarchids collected in the Garvins, Hooksett, and Amoskeag Pools during 2010-2013 include black crappie, bluegill, largemouth bass, pumpkinseed, redbreast sunfish, rock bass, and smallmouth bass. Four of the five most abundant species in Amoskeag Pool are centrarchids, as are four of the six most abundant species in Hooksett Pool. The trend is clear. For all four years, centrarchids contributed the greatest percentage of the total fish community in Amoskeag Pool and the least in Garvins Pool. Hooksett Pool was intermediate with respect to percent centrarchids in all four years.[117] Upstream-downstream gradients in abundance of individual fish species are also apparent in the fish community survey data. Total CPUE was highest in Garvins Pool, lowest in Amoskeag Pool, and intermediate in Hooksett Pool.[118]As explained by Dr. Barnthouse:

> This result implies that there is a clear upstream-downstream gradient in fish abundance within these three pools, consistent with established ecological principles. Abundance is highest in the

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[115] *Id.*

[116] *Id.* The centrarchids are among the most diverse and abundant groups of freshwater fish in North America. *Id.*

[117] *Id.* at 4-6.

[118] *Id.* at 6.

upstream Garvins Pool, lowest in downstream Amoskeag Pool, and intermediate in Hooksett Pool.[119]

In addition, community similarity analysis showed the fish communities in Garvins Pool to be more similar to the community in Hooksett Pool than in Amoskeag Pool, *i.e.*, there is an upstream-to-downstream gradient in community composition.[120] Upstream-to-downstream gradients are common in river fish communities, due to natural upstream to downstream gradients in habitat conditions.[121] Ultimately, Dr. Barnthouse concluded "[t]he fish communities present in all three pools consist of a mix of coolwater and warmwater species, with no clear pattern of dominance with respect to temperature classification, pollution tolerance, or feeding guild. **These data clearly provide no evidence that the thermal discharge from Merrimack Station has harmed the fish community in Hooksett Pool.**"[122]

Normandeau analyzed this same data set to compare the structure of the Hooksett Pool fish community over the 1972-2011 time period[123] using three established community indices: (1) taxa richness,[124] (2) the Shannon Diversity Index,[125] and (3) the Bray-Curtis Percent

[119] *Id.* (internal citations omitted).

[120] *See* AR-1300 at 16.

[121] *Id.*

[122] *Id.* at 18 (emphasis added). Dr. Barnthouse also considered Normandeau's comparison of the Merrimack River benthic invertebrate communities between the early 1970s and 2011 and found it evidenced biological conditions had improved in Hooksett Pool since the 1970s. *See id.* at 4-6, 43.

[123] *See* AR-1153.

[124] Taxa richness is a tabulation of the number of different species present in a community within a given area at a given time. It is used in combination with other indices of community structure to evaluate for potential shifts in the species composition over time within a given fish community. Here, taxa richness was calculated as the number of distinct species present within the Hooksett Pool in a given standardized sample year during the 1972-2011 time period.

[125] The Shannon Diversity Index combines information on the number of species in an assemblage (richness) and each species' relative abundance or "evenness" (*i.e.*, the number of individuals from each species in the same area) to measure overall diversity in a given community.

Similarity Index.[126] The application of each of these indices illustrated not only the diversity of the fish community in the Hooksett Pool as of 2011, but also the marked increase in diversity between 1972 and 2011, establishing that Merrimack Station's thermal discharge has not caused appreciable harm to the Hooksett Pool BIP.[127]

Normandeau performed several analyses that condense the species-specific data into index values that quantify the similarities between the fish communities in Garvins, Hooksett, and Amoskeag Pools.[128] Applying the Bray-Curtis similarity index, an ANOSIM (Analysis of Similarity) analysis comparing species composition between communities, and multidimensional scaling ("MDS"), all three different methods for community-level analysis of the 2010-2013 fish survey data support the same conclusion: The fish community in upstream Garvins Pool and the downstream Amoskeag Pool are both more similar to the intermediate Hooksett Pool than they are to each other, consistent with established ecological principles.[129] It is just as one would expect of a community without thermal discharge.

Normandeau summarized its analysis of the 2010-2013 fisheries data in its Response to EPA's Statement.[130] As explained in its Response:

> USEPA's finding of appreciable harm is clearly incorrect. Properly interpreted using the recent fisheries data collected from 2008-2013, the data show that over time, there have not been (1) appreciable decreases in *any* coolwater fish species in Hooksett Pool, (2) appreciable increases in warmwater species in Hooksett Pool, (3) appreciable decreases in the diversity of species in Hooksett Pool (as discussed in detail below, the Shannon Diversity

[126] Unlike taxa richness or rank abundance, this index calculates percent similarity among the fish taxa common in two sets of survey data – for example, the percent similarity between the fish taxa observed in the Hooksett Pool in 1972 as compared to the fish taxa observed in the Hooksett Pool in 2011. As a result, this assessment method can be particularly useful in demonstrating no prior appreciable harm.

[127] *See generally id.*

[128] *See id.*; Normandeau 2017a.

[129] *See* LWB 2017 Analysis at 8-10.

[130] *See* Normandeau 2017 Response.

Index value shows that the current fish population in Hooksett Pool is more diverse now than it was forty years ago), or (4) appreciable increases in the abundance of generalist feeders or pollution-tolerant species in Hooksett Pool.[131]

Further, Normandeau found no indication of appreciable harm based on its review of this data.

To summarize its findings:

- There has been no appreciable harm to the BIP in Hooksett Pool based on decreases in *any* coolwater species. Aquatic habitat that has been adversely impacted by a thermal discharge characteristically contains a higher abundance of fish species that are tolerant of warmer water, and a lower abundance of fish species that prefer cooler water. Merrimack Station's thermal discharge has not adversely impacted the abundance and distribution of fish in Hooksett Pool (the area of the Merrimack River from which Merrimack Station withdraws cooling water and into which it discharges heated effluent). If the Station's thermal discharge adversely impacted the abundance and distribution of fish in Hooksett Pool during 1972-2013, it would be expected that the abundance of resident coolwater species in the pool (as estimated by standardized electrofish sampling efforts conducted between 1972 and 2013), should have significantly decreased over time. However, no such significant decrease in abundance was observed for *any* of the five coolwater fish species resident in Hooksett Pool. The abundance of one coolwater fish, Black Crappie, has increased significantly in Hooksett Pool since its introduction and first detection during 2004. The lack of significantly decreasing trends for the other native and resident coolwater fish species (Chain Pickerel, Fallfish, White Sucker and Yellow Perch) are not consistent with the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the BIP in Hooksett Pool.[132]

- There has been no appreciable harm to the BIP in Hooksett Pool based on increases in warmwater species. As estimated by the same standardized electrofish sampling efforts, there have not been significant increases in abundance for nine of the ten warmwater fish species resident in Hooksett Pool during the 1972-2013 time period. Abundance of the native Pumpkinseed has significantly decreased and abundance of Rock Bass has significantly increased since its introduction and first detection during 1995 sampling.

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[131] *Id.* at 6 (citations omitted).

[132] *Id.* at 16 (citation omitted).

There were no significant differences in the abundance of Rock Bass within Garvins and Hooksett Pools during the period of comparable sampling in those locations (2010-2013) indicating Rock Bass in Hooksett Pool have not increased at a rate greater than that in the thermally uninfluenced Garvins Pool. The lack of a significant increase in the abundance of any warmwater fish species other than Rock Bass during the period of comparable sampling is not consistent with the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the BIP in Hooksett Pool.[133]

∞ There has been no appreciable harm to the BIP in Hooksett Pool based on a decrease in diversity of the fish community. Based on the 1972-2013 electrofish sampling efforts, the highest Shannon diversity index values for the Hooksett Pool fish community observed were in 2011 and 2013. Moreover, all of the per year diversity index values from the sampling years in the 2000s were higher than the values from the sampling years in the 1970s, indicating that the diversity of the fish community in Hooksett Pool – and therefore the biological health of that community – has generally increased, not decreased, over the past forty years. Community evenness values for each year of comparable sampling between 1972 and 2013 indicate the current Hooksett Pool fish community is distributed more equitably among species than the community during the 1970's which was dominated by a limited number of fish species. Examination of richness, diversity and evenness values for each year of comparable sampling supports a finding that Merrimack Station's thermal discharge has not reduced the diversity of the fish community in Hooksett Pool. These findings support the hypothesis that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in the Hooksett Pool.[134]

∞ There has been no appreciable harm to the BIP in Hooksett Pool based on an increase in generalist feeders. The percentage of generalist feeders in a fish community increases as the physical and chemical habitat deteriorates (Barbour et al. 1999). The percentage of generalist feeders was highest in Hooksett Pool in 1976 and lowest in 2010 across the 1972-2013 data set. The decrease in percent generalist feeders from the 1970's to present can be attributed to the decrease in abundance of Pumpkinseed, a generalist feeder that represented more than 50% of the Hooksett Pool fish community in the early 1970's. Decreases in

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[133] *Id.*

[134] *Id.* at 16-17.

Pumpkinseed are linked to improved water quality leading to decreases in submerged aquatic habitat and subsequently an increase in competition with Bluegill, a species that could not survive the low DO levels that existed in the pool in the early 1970's. The reduced percentage of generalist feeders in Hooksett Pool from 1972 to 2013 supports a finding that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP in Hooksett Pool.[135]

∞ "A review of generalist feeders and pollutant tolerant species compared between Hooksett Pool and Garvins Pool indicates that there has been no appreciable harm to the BIP in the Hooksett Pool."[136]

Like Dr. Barnthouse, Normandeau also observed that a spatial comparison among the fish communities sampled in Garvins, Hooksett and Amoskeag Pools during 2010, 2011, 2012, and 2013 evidenced a trend of decreasing similarity among Pools moving downriver from Garvins Pool to Hooksett Pool to Amoskeag Pool.[137]

Long-term population trend analyses further support a conclusion of no appreciable harm due to the operation of Merrimack Station. Normandeau has performed analyses of long-term trends in abundance of fish populations in Hooksett Pool based annual mean CPUE from electrofish sampling.[138] The data used in these analyses were obtained from sampling efforts

[135] *Id.* at 17.

[136] *Id.* at 18. In its Response, Normandeau explains that "[a]lthough the percentage of generalist and tolerant species were higher in Hooksett Pool than Garvins Pool during 2010 through 2013, (except for 2013 when pollution tolerant fish were higher in Garvins Pool), these differences were the result of increased relative abundance of both coolwater and warmwater species in Hooksett Pool." *Id.* Further, "[t]he data demonstrates that the dominant generalist species in Hooksett Pool were similar to those present in Garvins Pool during each sampling year." *Id.* at 19. "The uniform dominance of Bluegill as a tolerant fish species within both Hooksett and the thermally uninfluenced Garvins Pool suggests factors other than thermal regime (e.g., habitat diversity, food resources) are likely contributing to the observed differences." *Id.*

[137] *Id.* at 14.

[138] CPUE is commonly used by fisheries scientists as an index of population density or stock size and was used here as a relative index of the occurrence and population size (*i.e.*, abundance) of each selected fish species in the Hooksett Pool. EPA itself has identified electrofishing as "the most comprehensive and effective *single* method for collecting stream fishes." *See, e.g.*, AR-1164 at 8-2.

conducted during August and September of the years with standardized sampling (1972, 1973, 1974, 1976, 1995, 2004, 2005, 2010, 2011, 2012, and 2013).[139]

Normandeau's most recent report documented trends analyses for 15 species.[140] Of these 15, results indicated that there was a statistically significant increasing trend in annual mean CPUE in Hooksett Pool over 1972-2013 for two species (Black Crappie and Rock Bass), a statistically significant decreasing trend in annual mean CPUE in Hooksett Pool for one species (Pumpkinseed) and no detectable significant trend in annual mean CPUE in Hooksett Pool during the time series for the remaining 12 species.[141] Temperature guilds (*i.e.*, coolwater/warmwater) for fish species, as defined in Normandeau 2011,[142] were assessed in the trends analysis. Among the five members of the coolwater guild, CPUE increased for one species whereas there were no significant trends among the four other coolwater fish species.[143] Among the 10 members of the warmwater guild, CPUE decreased for one species, CPUE increased for one species, and there were no significant trends for eight species.[144]

With respect to Normandeau's trends analyses, Dr. Barnthouse stated:

> The trends analyses . . . show that there have been changes in the fish community of Hooksett Pool over the period 1972-2013. Some species have declined in abundance while others have increased, but many species have simply fluctuated in abundance without any apparent trend. As discussed by Normandeau (2011) and Barnthouse (2016), it is likely that some of the changes in the fish community are consequences of improved water quality.

[139] AR-11; AR-1153. Selection of electrofish data for inclusion in the population trends analysis for the period 1972-2005 is described in § 3.0 of the report titled "Merrimack Station Fisheries Survey Analysis of 1967 through 2005 Catch and Habitat Data." AR-11. The 2010 and 2011 electrofish sampling in the Hooksett Pool is described in Normandeau 2011a. *See* AR-1153. The 2012 and 2013 sampling data is described in Normandeau 2017a.

[140] *See* Normandeau 2017a at 27.

[141] *See id.*

[142] AR-1153 at 51.

[143] *See* Normandeau 2017a at 27-28

[144] *Id.* at 28.

> However, there is no indication that these changes reflect differences in thermal preferences between species that are currently numerically dominant in the Hooksett Pool and species that were numerically dominant in the 1970s.[145]

Data on biocharacteristics of individual fish species also support a conclusion that the operation of Merrimack Station has caused no appreciable harm to fish populations present in the Hooksett Pool. Normandeau collected data on the biocharacteristics of various fish species, including the length, weight, age, and mortality for various fish species present in the Garvins, Hooksett, and Amoskeag Pools of the Merrimack River.[146] Normandeau also collected data on the reproductive characteristics of white sucker and yellow perch collected during March and April of 2012.[147] Normandeau considered the length-weight relationships for bluegill, largemouth bass, pumpkinseed, redbreast sunfish, and smallmouth bass collected from Garvins, Hooksett, and Amoskeag Pools between 2010 and 2013.[148] Based on evaluation of this data, Dr. Barnthouse reached conclusions[149] similar to those of Normandeau, as described in pages 53-59 of PSNH's 2012 Comments.[150] No consistent pattern in length-weight relationships is evident for any of these species.[151] These length-weight relationships support a conclusion that there is no systematic difference in condition between fish species present in Hooksett Pool and fish present in either Garvins Pool or Amoskeag Pool.[152]

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[145] LWB 2017 Analysis at 11.

[146] *See generally* Normandeau 2017a.

[147] *Id.*

[148] *Id.* These species were selected because they are the only species for which the data were sufficient to compute length-weight relationships in all three pools for two or more years. LWB 2017 Analysis at 12.

[149] *See* LWB 2017 Analysis at 12-36.

[150] *See* AR-846 at 53-59.

[151] LWB 2017 Analysis at 12.

[152] *Id.* at 23.

Normandeau also considered data on parasite loads between Pools.[153] The parasitism data shows no evidence that fish in Hooksett Pool are parasitized to a greater extent than fish in Garvins Pool; to the contrary, parasitism during the three time periods examined appears to have been highest in Garvins Pool.[154] If stress related to Merrimack Station's thermal discharge was adversely affecting the health of fish inhabiting Hooksett Pool, this stress might be expected to increase the vulnerability of fish to attack by parasitism. No such vulnerability is evident in the parasitism data. Likewise, Normandeau concluded, "the biocharacteristics data collected during this 2008-2013 sampling confirms that when compared to the fish community in Garvins Pool, the fish community in Hooksett Pool in general is diverse, healthy and productive, as are individual species in Hooksett Pool."[155]

In 2008, 2009, and 2012, Normandeau conducted electrofishing surveys during the spring to characterize the reproductive condition of white sucker and yellow perch in Garvins, Hooksett, and Amoskeag Pools.[156] Data collected included sex ratios, reproductive condition, percent maturity, gonadosomatic index ("GSI"), age and length at maturity, and length-fecundity relationships.[157] For white sucker, few differences were found between Pools.[158] In 2008-2009, the percentage of white sucker that were female was higher in Hooksett Pool than in Garvins Pool or Amoskeag Pool,[159] but in 2008 there were no between-Pool differences in the percentage

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[153] *See* Normandeau 2017a.

[154] LWB 2017 Analysis at 28; *see also* Normandeau 2017 Response at 21. "Parasitism can be an indicator of increased stress on fish. If the fish present in Hooksett Pool were undergoing stress because of thermal discharge from the Merrimack Station, then it might be expected that fish present in this pool would have higher parasite loading than fish from Garvins or Amoskeag Pools." LWB 2017 Analysis at 27.

[155] Normandeau 2017 Response at 15.

[156] LWB 2017 Analysis at 28.

[157] *Id.*

[158] *Id.*

[159] *See* AR-1153, Table 4-14-14; LWB 2017 Analysis at 28.

of female fish.[160] In both 2008-2009 and 2012, there were no statistically significant between-Pool differences in the percent of female white sucker that were sexually mature.[161] In 2008-2009 there were no statistically significant between-Pool differences in GSI values,[162] although in 2012 GSI values for female white sucker in Garvins Pool were significantly lower than in Hooksett Pool or Amoskeag Pool.[163] The age and length at maturity of female white sucker was similar in all three ponds.[164] Length-fecundity relationships for white sucker are plotted in Figure 14 of Dr. Barnthouse's report based on regression parameters provided in Table 4-14-19 of Normandeau 2011a and Table 4.3.11-17 of Normandeau 2017a.[165] The relationships are very similar for 2008-2009, but for 2012 the fecundity of female white sucker in Garvins Pool was significantly lower than in Hooksett Pool or Amoskeag Pool.[166]

Data relating to the reproductive health of female yellow perch are especially relevant to interpreting the effects of Merrimack Station's thermal discharge, according to Dr. Barnthouse, because EPA asserted in section 5.6.3.3f of its § 316 Determination for Merrimack Station that the reproductive health of yellow perch in Hooksett Pool was being adversely affected by the station's thermal discharges during the winter months.[167] EPA stated, based on a review of published literature, that female yellow perch must be exposed to water temperatures of 10°C or lower for a minimum of 188 days to ensure full gonadal development.[168] According to EPA, fish

[160] LWB 2017 Analysis at 28-30 (citing Normandeau 2017a, Table 4.3.11-12).

[161] *Id.* at 30 (citing AR-1153, Table 4-14-16; Normandeau 2017a, Table 4.3.11-14).

[162] *Id.* (citing AR-1153, Table 4-14-17).

[163] *Id.* (citing Normandeau 2017a, Table 4.3.11-15).

[164] *Id.* (citing AR-1153, Table 4-4-18; Normandeau 2017a, Table 4.3.11-16).

[165] *See id.* at 31.

[166] *Id.* at 30.

[167] *See* AR-618 at 100-02; LWB 2017 Analysis at 30.

[168] *See* AR-618 at 101.

that overwinter within the Merrimack Station discharge canal would be exposed to substantially higher temperatures.[169] Because of these high exposure temperatures, EPA contests the gonads of female yellow perch overwintering within the canal would not be fully developed and would produce reduced numbers of viable eggs.[170] Dr. Barnthouse provides that if EPA's assertions are true, such impairment should be reflected in measurements of reproductive characteristics of female white perch in Hooksett Pool, especially in the numbers of eggs produced by mature fish.[171]

Section 4.15.6 of Normandeau 2011a[172] compared the percent maturity, age, and size at maturity of female yellow perch collected from Garvins Pool and Hooksett Pool during the spring spawning season in 2008 and 2009.[173] Normandeau found that females from Hooksett Pool became sexually mature at a younger age and a smaller size than females from Garvins Pool.[174] The percentage of females that were sexually mature was similar in both Pools, and the GSI's of mature females were also similar.[175] The length-fecundity relationships in the 2 populations were not significantly different.[176]

Normandeau 2017a provided similar data for 2012. As in 2008-2009, yellow perch were found to become sexually mature at a younger age and a smaller size in Hooksett Pool than in Garvins Pool.[177] In 2012, the GSI for female yellow perch in Hooksett Pool was somewhat

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[169] *Id.* at 180-81.

[170] *Id.*

[171] LWB 2017 Analysis at 30.

[172] *See* AR-1153.

[173] LWB 2017 Analysis at 32. The numbers of mature yellow perch collected in Amoskeag Pool were too small to support meaningful comparisons. *Id.*

[174] AR-1153 at 199-200.

[175] *Id.*

[176] *Id.* at 200.

[177] *See* Normandeau 2017a at 124-25.

lower than in Garvins Pool, however, the length-fecundity relationships in both Pools were similar.[178] Dr. Barnthouse plotted these relationships in Figure 15 of his report[179] and further provides: "If EPA's assertion were correct, mature female fish at any given length should have a lower fecundity in Hooksett Pool than in Garvins Pool. However, as shown in Figure 15, fecundity at any given length was actually higher in Hooksett Pool, although the difference is not statistically significant."[180] According to Dr. Barnthouse, "[t]hese results directly contradict EPA's assertion that female yellow perch are reproductively impaired in Hooksett Pool due to exposure to elevated winter temperatures" in the Merrimack Station discharge canal.[181]

In summary, four years of comparative data are now available for both upstream (Garvins) and downstream (Amoskeag) Pools. As stated by Normandeau: "Here a review of biocharacteristics for thirteen fish species resident in both Hooksett Pool and Garvins Pool did not indicate a consistent pattern of impaired health and condition for either warmwater or coolwater individuals residing in Hooksett Pool [] which is supportive of a finding of 'no prior appreciable harm' due to Merrimack Station operations."[182]

With respect to population trends, analysis of the new data confirms that, although some species have declined in Hooksett Pool while others have increased, most species have fluctuated in abundance without any obvious trends. Finally, comparisons of the fish communities in these three Pools demonstrate the communities present in each Pool are relatively consistent through time, and "[t]hese communities differ in ways that reflect an upstream-downstream gradient that is well-documented in published literature, with the fish community in Hooksett Pool being

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[178] *See id.*

[179] LWB 2017 Analysis at 34.

[180] *Id.* at 32.

[181] *Id.*

[182] Normandeau 2017 Response at 22 (citing AR-1153; Normandeau 2017a).

intermediate between the communities in Garvins Pool and Amoskeag Pool."[183] Thus, as concluded by Dr. Barnthouse:

> There is no indication of any anomalous fish population or community characteristics in Hooksett Pool that could be related to the operation of Merrimack Station, and therefore no evidence that those operations have caused or are now causing any appreciable harm to the fish community in the Merrimack River.[184]

Therefore, the analyses of more detailed, recent data, as analyzed by both Normandeau and Dr. Barnthouse, corroborates the conclusions from Normandeau's prior reports as explained in PSNH's 2012 Comments. The data show that over time, there have not been (1) appreciable decreases in coolwater fish species in the Hooksett Pool, (2) appreciable increases in warmwater species in the Hooksett Pool, (3) appreciable decreases in the diversity of species in the Hooksett Pool or (4) appreciable increases in the abundance of generalist feeders or pollution-tolerant species in the Hooksett Pool.[185] When compared to the Garvins Pool, the biocharacteristics of the fish population in the Hooksett Pool in general, and of the individual species in the Hooksett Pool in particular, indicate no appreciable harm to the BIP.[186] Likewise, analysis of abundance data for both coolwater and warmwater fish in Hooksett Pool do not show a consistent pattern of increase or decrease in abundance to support the hypothesis that Merrimack Station's thermal discharge has caused appreciable harm to the fish community in the Pool.[187] This conclusion is corroborated by the most recent data through 2013, as well as Normandeau's and

[183] LWB 2017 Analysis at 35-36.

[184] *Id.* at 36.

[185] *See, e.g.*, AR-1153 at 1; Normandeau 2017 Response at 6.

[186] *See, e.g.*, *id.*

[187] *See generally* AR-1153; Normandeau 2017a; LWB 2017 Analysis; Normandeau 2017 Response.

Dr. Barnthouse's study of this more recent data.[188] Hooksett Pool is a BIP. Merrimack Station's thermal discharge has caused no appreciable harm.

2. EPA's Denial of PSNH's Request for a Variance Remains Premised on an Egregiously Flawed Finding That the Hooksett Pool in the Late 1960s Constitutes the BIP

EPA's Statement is silent concerning a fatal flaw behind its 2011 Draft Permit—namely, that its rejection of PSNH's § 316(a) variance request is based on a comparison of Hooksett Pool in 2011 to its condition in the late 1960s, when the Merrimack River was in its most polluted condition in its recorded history and one of the most polluted rivers in the country. In its 2011 Draft Permit, EPA found "the resident biotic community identified during sampling conducted from 1967 to 1969 to best represent the [BIP] . . . ."[189] Erroneously, EPA concluded that a river impaired by uncontrolled, pre-CWA releases of raw sewage, waste from wood and paper processing and textile mills, other phosphates and pollutants[190] could represent a BIP, and, using that baseline, denied PSNH's request for a thermal variance based on its finding that the current habitat of Hooksett Pool is "no longer able to support the fish community that existed in the 1960s, or early 1970s."[191] As described in Normandeau 2011b, during the period selected by EPA for its BIP determination, the Hooksett Pool was severely impaired as a result of uncontrolled releases of raw sewage and other phosphates:

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[188] *See generally* Normandeau 2017a; LWB 2017 Analysis.

[189] AR-618 at 31.

[190] *See* AR-1172 at 3; AR-872 at 14 (citing USGS 2003, "As late as the mid-1960s, more than 120 million gallons per day of untreated or minimally treated wastewater were discharged into the Merrimack River.") (citation omitted); *see also* AR-1245; AR-1246; AR-1247; AR-1248.

The effect of this contamination on the aquatic biota of the river is well-documented. *See* AR-872 at 15-17 (discussing U.S. Department of Interior study measuring nutrient levels, total and fecal coliform, dissolved oxygen and biological oxygen demand levels that indicate harm to the biotic community from the pollution levels of the river).

[191] AR-618 at 118.

> Historic observations of this contamination give a picture of a river contaminated beyond our current comprehension: sewage so dense that a single drop contains "dangerous" levels of bacteria; coliform bacterial counts exceeding 1 million per 100 ml for several cities; toxic metals and wastes including phenol and cyanide found in the river; suspended solids covering the river bottom and decomposing, causing gas to bubble up "as if the river were cooking"; and a predominant smell of rotten egg from hydrogen sulfide, which can ruin painting on boats and houses (Wolf 1965).[192]

In his February 2016 analysis, Dr. Larry Barnthouse described this conclusion as one of three significant flaws that invalidate EPA's conclusion that the operation of Merrimack Station with once-through cooling has caused appreciable harm to the BIP of Hooksett Pool.[193] Referring to EPA's 1997 Draft § 316(a) Guidance, Dr. Barnthouse specifically noted EPA's quotation that, "[a] determination of the indigenous population should take into account all impacts of the population except the thermal discharge."[194] EPA's failure to consider the Merrimack River's highly polluted condition during the 1960s and its transition to the greatly improved conditions in more recent years failed this guidance. As explained by Dr. Barnthouse:

> As required by the Clean Water Act, all of the untreated discharges identified in the USDI (1966) report ceased by 1972. The resulting improvements in water quality, which are documented in Normandeau's (2011a) report, would have been expected to lead to biological changes in the Merrimack River, including replacement of highly pollution-tolerant species by species with lower pollution tolerance. An increase in the number of species present in the community would be expected (Rapport et al. 1985). Rather than being limited to those species present at the time Merrimack Unit 2 was constructed in 1968, the BIP should include species whose

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[192] AR-1172 at 3.

[193] AR-1300 at 43. The other, two flaws identified by Dr. Barnthouse are: (1) EPA's over-reliance on classification of fish as "coolwater" or "warmwater" when interpreting population trends, and (2) its erroneous interpretation of Merrimack River temperature data when evaluating effects of thermal exposures on representative fish species. *Id.*

[194] AR-1300 at 3 (quoting AR-444 at 74).

> presence in the river may have been facilitated by implementation of the pollution control requirements of the Clean Water Act.[195]

Improvements in water quality likewise are reflected in Normandeau's comparison of the benthic invertebrate data collected in 1972 and 1973 to data collected in 2011.[196] As explained by Dr. Barnthouse, information on the composition of benthic invertebrate communities is routinely used to assess the extent of impairment of aquatic communities (if any) due to potential stressors such as habitat degradation and pollutant discharges.[197] Considering the data against five benthic community indices (taxa richness, the Hilsenhoff Biotic Index, Ration of EPT abundance to Chrinomidae abundance, percent contribution of dominant taxon to the total number of organisms in each sample, and EPT richness), Dr. Barnthouse determined, as did Normandeau, that biological conditions have improved since the 1970s.[198]

Thus, to the extent EPA attributes all changes in abundance levels of some fish species to thermal discharges from Merrimack Station,[199] it ignores the effect of the improvements to water quality resulting from the CWA. Not surprisingly, as explained by PSNH in its 2012 comments, the fish community of the Hooksett Pool in the 1960s timeframe does not meet the required characteristics of a BIP.[200] Thus, it was inappropriate to use a 1967-based fish community that existed in sewage and phosphate polluted waters to assess whether there has been appreciable

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[195] *Id.* at 4.

[196] *Id.* at 4-6.

[197] *Id.* at 4.

[198] *Id.* at 5-6.

[199] *See, e.g.,* AR-618 at 59 (alleging that the Station's thermal discharge caused yellow perch population decline); *id.* at 60 (alleging that the Station's thermal discharge caused pumpkinseed population decline); *id.* at 74 (alleging "dominance of heat-tolerant species in Hooksett Pool [is] indicative of appreciable harm to the balanced, indigenous community").

[200] AR-846 at 13-17.

harm to the Hooksett Pool. EPA's conclusions regarding the effects of Merrimack Station's thermal discharge are therefore irredeemably flawed.

C. EPA's Misinterpretation of Key Temperature Data In Its 2011 Draft Permit Further Undermines the Agency's Decision to Deny PSNH's Request for a Thermal Variance

As EPA acknowledged in its Statement, EPA denied PSNH's request for a thermal variance from the requirements of § 316(a) based on a material misinterpretation by EPA of temperature data contained in Appendix A of Normandeau's April 2007 report, "A Probabilistic Thermal Model of the Merrimack River Downstream of Merrimack Station."[201] Appendix A of the 2007 Report tabulates "Historical Maximum, Minimum and Mean Average Daily Temperature as Measured at Merrimack Station Monitoring Stations N10, S0 and S4 and Predicted at Monitoring Station A-0 for Merrimack during the 1 April to 1 November period of 1984-2004."[202] EPA seeks comment concerning the import of this misinterpretation and concerning PSNH's new data submissions since closure of the 2012 comment period, as well as how shorter and longer-term thermal data should be factored into EPA's evaluation of the effects of Merrimack Station's thermal discharges on Hooksett Pool and EPA's development of thermal discharge limits for Merrimack Station.[203]

As EPA recognizes in its Statement, PSNH acknowledges that EPA's misunderstanding and misinterpretation of this data may have stemmed from a lack of clarity in Normandeau's April 2007 report. Nonetheless, EPA's interpretative error is substantial and permeates the entirety of its 2011 Fact Sheet and § 316(a) determination. When correctly interpreted, these data provide the minimum, average, and maximum daily average temperatures on a given

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[201] *See* AR-1534 at 38.

[202] AR-10, Appendix A-2 through A-8.

[203] *See* AR-1534 at 40.

calendar day that occurred typically only one time during the 21 years monitoring data was collected between 1984 and 2004.[204] By assuming the maximum daily average temperatures reported in Appendix A represented the 21-year average for each calendar day, EPA greatly overstated the actual river temperatures to which fish were exposed during those years. Indeed, based on this error, EPA concluded that the temperatures exceeded thermal tolerance criteria for alewife, American shad, yellow perch, and white sucker. When correctly interpreted, the data shows that most of the thermal tolerance limits used in EPA's analysis were never exceeded on dates at which the species and life stages in question are present in the river.[205] Compounding the error, EPA did not consider that, with respect to the RIS and their thermal tolerances, the area and volume of the Pool affected by the plume is negligible. Finally, EPA's confusion of a short term, 24-hour average value with a long term average does not yield a new data point of significance. Forty-five years of actual study demonstrate an absence of prior appreciable harm to the fish and macroinvertebrate communities and water quality of Hooksett Pool. Theoretical temperature tolerance thresholds pulled from a patchwork of academic reports cannot supersede the exhaustive, hands-on studies of every component of the aquatic ecosystem in the waterbody.

1. EPA's Interpretative Error is Substantial and Permeates Its Entire § 316(a) Analysis

PSNH's consultant, Normandeau, first identified the agency's interpretive error in its February 2012 Comments on EPA's Draft Permit for Merrimack Station.[206] It was not until PSNH submitted its September 4, 2015 letter to EPA, however, that the agency appreciated the gravity of its misinterpretation. The maximum temperature values provided in Appendix A of

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[204] *See* AR-10, Appendix A-2 through A-8.

[205] *See* AR-1300 at 13. And in those few instances in which EPA's criteria were exceeded, the number of dates on which they were exceeded, and the durations of the period when any exceedances occurred, were much smaller than was asserted by EPA and do not support a finding of appreciable harm. LWB 2017 Response at 2.

[206] AR-1534 at 38 (citing AR-10, Appendix A-2 through A-8).

Normandeau's 2007 Thermal Model Report represented the maximum daily average that occurred on a given calendar day typically only one time during the 21 years monitoring data was collected between 1984 and 2004. EPA incorrectly construed these values as the 21-year average of the daily maximum temperatures for each day of the calendar year (*i.e.*, the "averaged daily maximum"). Normandeau's individual-day data tables in Appendix A do not offer any analyses with respect to the duration specific temperatures occurred on any given day, much less whether such durations spanned multiple days.

As explained in PSNH's September 4, 2015, letter to EPA, two examples illustrate the magnitude of EPA's error in its interpretation of the 21-year data set.[207] On page 120 of EPA's 2011 Fact Sheet (Attachment D) for the Draft Permit, EPA states: "The averaged daily maximum water temperature exceeded 83.0°F (28.3°C) . . . every day at Station S-4 from June 15 to September 10."[208] But this statement is incorrect. While it was proper for EPA to conclude from Appendix A to Normandeau's 2007 report that at some point in time during the 21-year data record the maximum daily water temperature at downstream Monitoring Station S4 exceeded 83°F at least one time on each given calendar day between June 15 and September 10 during the 21-year monitoring period, it was not correct to assert from the Appendix that these temperatures occurred on consecutive days in every year or even consecutively on any given days in any single year during this 21-year period. Second, the maximum water temperature values reported for Hooksett Pool Monitoring Stations N10, S0, or S4 (A0 is predicted) in Appendix A of Normandeau's 2007 Report do not represent actual, consecutive maximum daily mean temperatures occurring within the same year. Specifically, PSNH explained in its September 4, 2015 letter:

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[207] *See* AR-1367 at 2.

[208] AR-618 at 120.

> [T]he maximum daily water temperature at downstream Monitoring Station S-4 in the Hooksett Pool on August 10th during the period 1984 through 2004 was 94.1°F. Although not reported in Appendix A, this single maximum daily water temperature among all 21 years of recorded data at Monitoring Station S-4 actually occurred on August 10, 1988. The maximum water temperature for August 11th among all 21 years of Monitoring Station S-4 data was 93.6°F, but this temperature occurred almost three years earlier, on August 11, 1985 . . . . EPA therefore erred in assuming that the maximum temperatures are consecutive within the same year and in using the Appendix A data in this manner.[209]

EPA's misinterpretation of Normandeau's 2007 Thermal Model Report is a cornerstone of the agency's 2011 Fact Sheet and its entire § 316(a) analysis.[210] EPA acknowledges this in its 2011 Fact Sheet: "Given its spatial and temporal coverage, EPA considered this data set [from the 2007 Normandeau Thermal Model Report] to be representative of actual thermal conditions in Hooksett Pool, and used it to assess potential temperature effects on certain species and lifestages . . . ."[211] What follows is a representative sample of instances in the 2011 Fact Sheet in which EPA relied upon its misinterpretation of the data in a manner that calls into question the agency's assertions and/or conclusions:

- Fact Sheet at 84-85: Comparing the 21-year Normandeau data set to Applied Science Associates, Inc.'s 2009 temperature study period and discrediting the 2009 data as not representative of typical river conditions by utilizing the misinterpreted Normandeau data;
- Fact Sheet at 89: Incorrectly asserting that the averaged maximum temperatures at Station S4 exceeded 84°F every day from June 25 to September 8;
- Fact Sheet at 93: Incorrectly asserting that that the average maximum temperature at Station S4 exceeded 85°F every day from June 25 to September 3;
- Fact Sheet at 93-94: Incorrectly asserting that the averaged maximum temperatures at Station S0 reached 92.9°F in mid-June;

[209] AR-1367 at 2.

[210] *See generally* AR-618.

[211] *Id.* at 81-82.

- Fact Sheet at 104: Incorrectly asserting that the average daily maximum water temperatures at Station S0 ranged from a low of 79.2°F on May 3 to a high of 94.3°F on June 12;

- Fact Sheet at 105: Incorrectly asserting that temperatures "well exceeding" 89.6°F at Station S0 continue for the duration of the yellow perch larval period;

- Fact Sheet at 106: Referencing average daily maximum water temperatures and incorrectly asserting that they were at or exceeding certain threshold temperatures annually during discrete time periods;

- Fact Sheet at 107: Incorrectly asserting the averaged daily maximum temperature exceeded 82.4°F at Station S4 every day from June 10 to September 10 from 1984 to 2004;

- Fact Sheet at 112-13: Incorrectly referencing averaged daily maximum temperatures at S0 and S4 as exceeding certain thresholds on certain dates;

- Fact Sheet at 115: Incorrectly asserting that average daily maximum temperatures exceeded 85.8°F every day at Station S4 from June 25 to September 1;

- Fact Sheet at 119: Incorrectly referencing averaged daily maximum temperatures at S0 as exceeding certain thresholds on certain dates;

- Fact Sheet at 203: Incorrectly referencing averaged daily maximum temperatures at S0 as exceeding certain thresholds on certain dates;

- Fact Sheet at 204: Incorrectly asserting that the difference between maximum ambient river temperatures and average maximum temperatures at the mouth of the discharge canal "routinely exceeded" a certain threshold; and

- Fact Sheet at 206: Incorrectly asserting that the averaged maximum recorded temperatures at Station S0 reached 92.9°F in mid-June for the 21-year data set.

There are other instances of EPA relying on its misinterpretation of this data in the Fact Sheet and/or administrative record that are not readily apparent from the text. Nevertheless, it is clear from the above examples that this misinterpreted temperature data is foundational to the agency's § 316(a) analyses and conclusions and must be revisited by EPA.

2. EPA's Misinterpretation of Representative Data Substantially Overstates Actual Temperatures to Which Aquatic Species Were Exposed

EPA relied on the erroneous interpretation of the temperature data in evaluating the thermal effects on fish, comparing critical temperature values from scientific literature for various life stages of fish to temperatures from Appendix A for two stations: Stations S0, at the end of the Merrimack Station discharge canal, and Station S4, a thermally influenced station downstream from the canal. PSNH's consultant, Dr. Barnthouse, reviewed EPA's misapplication of this temperature data and summarized his findings in a report entitled "Review of technical documents related to NPDES Permitting Determination for the Thermal Discharge and Cooling Water Intake Structures at Merrimack Station," which was submitted to the agency in February 2016.[212] This report sets out a representative sample of EPA's errors in its Attachment D to the 2011 Draft Permit and explains how EPA's analyses must be revised to account for the actual temperature data included in Appendix A of Normandeau's 2007 Thermal Model Report. These examples are discussed below and provide further proof EPA must revisit the entirety of the agency's § 316(a) analysis.

First, three of the species evaluated by EPA—the alewife, American shad, and Atlantic salmon—do not reproduce naturally in the Merrimack River and therefore would be present in the Hooksett Pool solely because of upstream stocking efforts.[213] Eggs and larvae from the three species could only be present in the waterbody segment due to potential drift following spawning, according to Dr. Barnthouse.[214] Juveniles of these three species would only be

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[212] *See* AR-1300.

[213] *Id.* at 12.

[214] *Id.*

present in the Hooksett Pool for a discrete period of time as they pass through during outmigration.[215]

As to the alewife species, EPA's assertion that Merrimack Station's discharge creates an "unsuitable habitat" based on the agency's comparison between a temperature observed to be lethal to alewife larvae (94.1°F) and what EPA misinterpreted as the average maximum temperature recorded at Station S0 on a given date when herring larvae were collected in entrainment samples at the station (also 94.1°F) is likewise erroneous.[216] As explained above, this 94.1°F was the singular highest average temperature observed at Station S0 on one given date during a 21-year period, not the average maximum temperature for that date over all 21 years.[217] EPA's use of this singular day data-point in a 21-year period to support a conclusion of appreciable harm provides "an unrealistically conservative analysis."[218]

Dr. Barnthouse also successfully refutes EPA's use of temperature data from S4 to maintain that temperatures at the monitoring Station are higher than the published, preferred temperatures of alewife juveniles and therefore Merrimack Station's thermal discharge creates an unsuitable habitat for juvenile alewives. These temperatures occur at S4 only between June 25 and September 4. Years of historical impingement data collected by PSNH, in fact, reveal that outmigrating juvenile alewives do not pass by Merrimack Station until early September through October. EPA's analysis is therefore arbitrary and capricious and cannot reasonably be used to support a conclusion of appreciable harm.

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[215] *Id.*

[216] AR-618 at 88.

[217] *See* AR-1300 at 12.

[218] *Id.*

Further, Dr. Barnthouse notes EPA incorrectly applied temperature data from Normandeau's 2007 report to assess the effects, if any, of Merrimack Station's thermal discharge on American shad.[219] Utilizing laboratory-derived thermal tolerance limits, EPA provides on page 93 of its 2011 Fact Sheet that the habitat at Station S4 is an unsuitable habitat for juvenile American shad because the average maximum temperature at that station from Appendix A exceeds the maximum tolerance limit from published literature on "every date from June 25 to September 3."[220] This conclusion, like many others in the 2011 Fact Sheet, is incorrect due to EPA's misinterpretation of the temperature data. Applying average daily temperatures over the 21 year period, between June 25 and September, temperatures at S4 were well below the tolerance limit (85°F) for American shad.[221] The data, when correctly interpreted, "means that on average the habitat at Station S-4 was suitable for American shad on all days throughout this period, although during exceptionally warm years temperatures outside the preferred range occurred on some days."[222] EPA's analysis of acute mortality due to thermal plume exposure is also invalid, according to Dr. Barnthouse, "because it assumes that juvenile shad are acclimated to cool temperatures found upstream of the discharge (Station N-10), swim or drift downstream to Station S-0, and remain within the plume long enough to die. In reality, any juvenile [American] shad approaching the plume would simply avoid the elevated temperatures altogether."[223]

Misinterpretation of temperature data from Normandeau's 2007 Thermal Model Report by EPA also renders ineffectual the agency's assessment of Merrimack Station's thermal

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[219] *See* AR-1300 at 12-13.

[220] AR-618 at 93.

[221] AR-1300 at 13.

[222] *Id.*

[223] *Id.*

discharges on the survivability of yellow perch larvae, according to Dr. Barnthouse. EPA utilizes thermal tolerance limits from literature to support its assertion that temperatures at Station S0 would cause appreciable harm to yellow perch larvae.[224] In fact, mean daily temperatures at Station S0 did not exceed any of the thermal limits discussed by EPA between May 1 and June 14, which is the time yellow perch larvae were collected in Normandeau's ichthyoplankton survey, and neither the mean nor the maximum average daily temperature exceeded these limits at Station S4.[225] EPA's analysis of effects of thermal exposure on juvenile and adult yellow perch is equally flawed based on the agency's misinterpretation of temperature maximums provided in Appendix A of Normandeau's 2007 report.[226] Specifically, EPA claims in its 2011 Fact Sheet that the average daily maximum water temperature at Station S4 exceeded the avoidance temperature of yellow perch on every day from June 15 to September 10, in each of the 21 years in the data set.[227] This is incorrect. Correctly interpreted, the maximum temperature listed in Appendix A from June 15 to September 10 was reached in only one year out of the 21-year data set and these maximums often were not reached in the same or even sequential years.[228]

As a result of EPA's erroneous interpretations, the entirety of EPA's yellow perch reproduction discussion in the agency's 2011 Fact Sheet is necessarily flawed. EPA specifically asserts that yellow perch are attracted to the thermal refuge of the discharge canal during winter months, which may result in premature spawning in the canal and may impair reproductive ability due to the lack of a "chill period" necessary for complete development of the species'

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[224] *See, e.g.*, AR-618 at 100, 180-81.

[225] AR-1300 at 13-14.

[226] AR-1300 at 14.

[227] *See, e.g.*, AR-618 at 106.

[228] AR-1300 at 14.

gonads.[229] As explained by Dr. Barnthouse, this supposed "chill period" hypothesis for yellow perch is highly speculative and EPA's premature spawning theory is "highly unlikely."[230]

EPA's misapplication of the temperature data in Normandeau's 2007 report also resulted in its erroneous evaluation of the effects of Merrimack Station's thermal discharge on the white sucker population.[231] As to larvae and juveniles, EPA improperly compares what it perceives are the average maximum temperatures at Stations S0 and S4 to laboratory-derived thermal tolerance limits to conclude thermal discharges from Merrimack Station are causing appreciable harm to white suckers at these life stages.[232] Looking only at the mean average daily temperatures, Dr. Barnthouse explains:

> [T]emperatures at Station S-0 would have begun to exceed the lethal temperature for white sucker larvae on or about June 22, near the end of the period during which white sucker larvae are present in the vicinity of Merrimack Station. At Station S-4 downstream from the discharge, the average temperature would never exceed the thermal tolerance limit. Similarly, the average daily temperatures at Station S-4 never exceeded the thermal tolerance limit identified by EPA for juvenile and adult [yellow] perch . . . .[233]

Although a discrete set of maximum average daily temperature values at Station S4 during exceptionally warm periods did exceed the tolerance limit for white sucker in the 21-year data set, these exceedences are immaterial because electrofishing samples discussed by EPA on page 114 of its 2011 Fact Sheet reveal the distribution of white suckers during the summer is primarily upstream from the thermal discharge.[234] These fish may prefer cooler water upstream of the

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[229] AR-618 at 100-102.

[230] *See* AR-1300 at 13 (citing Carlander (1997) as support for the fact that yellow perch prefer to spawn over vegetation or submerged branches, which would not be present in Merrimack Station's discharge canal).

[231] *See* AR-1300 at 14.

[232] *See, e.g.,* AR-618 at 112-13.

[233] AR-1300 at 14.

[234] AR-618 at 114.

discharge, according to Dr. Barnthouse, and simply avoid the lower portions of the Hooksett Pool during these times, although other habitat characteristics besides temperature could explain this distribution.[235]

PSNH's submissions also demonstrate that the thermal tolerance limits EPA used to establish water-quality based thermal standards were in many cases incorrect or inappropriately applied.[236] Limits that are not supported by the literature cited by EPA include the winter limit for yellow perch maturity (8°C), yellow perch egg development (18°C), long-term exposure for yellow perch larvae (21.3°C), and long-term exposure for yellow perch juveniles and adults (25.1°C).[237] Dr. Barnthouse provides that limits EPA inappropriately applied include the short-term limit for yellow perch larvae, the short-term limit for yellow perch juveniles and adults, and both the short-term and long-term limits for American shad larvae and juveniles.[238]

3. EPA's Evaluation of PSNH's Variance Request Should be Premised on the Last 10 Years of Data Because They More Accurately Reflect Plant Operations

To the extent EPA considers temperature data in its permitting analysis, use of the last 10 years of plant and Merrimack River data PSNH previously provided to EPA[239] is in accordance with EPA's standards for issuing NPDES permits. For example, the 2014 final § 316(b) rule and regulations provide that studies, analyses, and/or data from the most recent 10-year period are most relevant for NPDES permit determinations and older data may only be considered if the permittee is able to demonstrate the data remains relevant and representative of current

[235] *See* AR-1300 at 14.

[236] *See, e.g.,* AR-1300; LWB 2017 Response.

[237] *See* AR-1300 at 22-30.

[238] *See id.*

[239] *See* AR-1305; AR-1306; AR-1307.

conditions at the facility.[240] With respect to the latter consideration, the opposite is true. Data from beyond this 10-year period is no longer representative of current conditions at Merrimack Station.

Merrimack Station has also changed significantly over the past decade with the installation of a scrubber system for the facility's two coal-fired boilers. The station's Clean Air Project went into commercial service in 2011, and included the installation of a wet flue gas desulfurization treatment technology, wastewater treatment systems (including the secondary wastewater treatment system), limestone and gypsum handling and storage equipment, and chimney equipment. The total project cost exceeded $400 million and has substantially altered the layout of Merrimack Station. The 2002 through 2015 data set PSNH previously provided to EPA[241] includes several years both before and after completion of the Clean Air Project, and is more representative of current plant operations than other historical years, including but not limited to the 1984 to 2004 data set EPA requested from PSNH in 2015.[242]

Apart from using design intake flow ("DIF") to determine a facility's applicability to the overall rulemaking, the final § 316(b) rule principally relies upon the three-year and/or five-year average actual intake flow ("AIF") (i.e., the actual volume of water withdrawn) to determine which facilities subject to the rule must submit a number of comprehensive studies with an NPDES permit application.[243] EPA correctly utilizes data from the most recent, relevant <u>actual</u> operations of a facility (i.e., the last three to five years of operation) in this § 316(b) context to formulate its permit decisions.

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[240] *See* 40 C.F.R. §§ 122.21(r)(6)(ii)(A), (r)(7).

[241] *See* AR-1305; AR-1306; AR-1307.

[242] *See* AR-1298.

[243] *See, e.g.,* 79 Fed. Reg. 48,300, 48,308-09 (Aug. 15, 2014).

EPA's own NPDES Permit Writers' Manual similarly supports use of recent historical, average effluent data (i.e., the last three to five years of data) when establishing technology-based limitations for other pollutants of concern.[244] This is corroborated by the agency's NPDES application Form 2C for wastewater discharges, which requires all sampling required by the Form to have been completed "no more than three years before submission" of the application.[245] Indeed, CWA § 402(b)(1)(B) provides that NPDES permits are to be issued "for fixed terms not exceeding five years,"[246] meaning any permittee seeking to renew its permit is required to submit new effluent data prior to the expiration of its current permit—giving permit writers an opportunity to regularly revisit this average effluent data. For all of these reasons, to the extent EPA considers temperature data at all—despite the 40+ years of biological studies demonstrating no prior appreciable harm to the BIP—EPA's standards and practices in the NPDES program make clear that this most recent dataset is the appropriate one for EPA's § 316(a) analysis.

4. Application of CORMIX Provides Further Evidence That No Appreciable Harm Has or Will Occur Due to Merrimack Station's Thermal Discharge

Compounding its erroneous interpretation of the data and resulting analyses, EPA also failed to consider that the thermal plume impacts only a negligible percentage of the surface area and habitat volume where the RIS can be expected to be found. In December 2016, PSNH submitted two reports that, in combination, demonstrate the thermal plume from Merrimack Station does not affect more than a negligible fraction of the fish habitat present downriver from

[244] *See, e.g.,* EPA, NPDES Permit Writers' Manual, § 5.2.2.5, at 5-30 (Sept. 2010) (providing that permit writers can establish permit conditions using data from the past 3 to 5 years and that the goal in selecting the relevant data set is for it to be "representative of the actual [permit conditions] likely to prevail during the next term of the permit"); *see also* 55 Fed. Reg. 47,990, 48,020 (Nov. 16, 1990) (codified at 40 CFR pts. 122, 123, and 124) (in responding to a public comment regarding NPDES permit application requirements, EPA agreed with the commenter that "any information requested [in the application] should be limited to a period of three years[.]").

[245] EPA, Application Form 2C–Wastewater Discharge Information, EPA Form 3510-2C, at 2C-1 (Aug. 1990), available at https://www3.epa.gov/npdes/pubs/3510-2C.pdf.

[246] 33 U.S.C. § 1342(b)(1)(B).

the Station's thermal discharge and has had no measurable impacts on the fish community in Hooksett Pool.[247] Using CORMIX modeling software long supported by EPA and used as a tool in EPA's NPDES permit writing process, Enercon modeled the thermal plume within the Merrimack River, and characterized the area and volume the plume occupies within the waterbody.[248] Enercon's CORMIX modeling utilizes for its inputs fish species-specific temperature criteria (*i.e.*, thermal limits) provided in Tables 1 through 3 of Dr. Barnthouse's report entitled "Influence of Merrimack Station's Thermal Plume on Habitat Utilization by Fish Species Present in Lower Hooksett Pool" ("Habitat Report"),[249] as well as plant operational data and Merrimack River flow rate, temperature, and relevant wind speed data from the last ten years (2006-2015).[250] The CORMIX thermal plume model was used to calculate average plume characteristics over the period 2006-2015 for three representative time periods: early spring (May 2 – May 8), late spring (June 9 – June 15), and mid-summer (July 29 – August 4).[251]

Utilizing the CORMIX outputs from the modeling and considering the thermal effects data compiled in Normandeau 2007a, Dr. Barnthouse identified regions within the river that would be excluded from use by one or more of the RIS due to the presence of the plume.[252] Species chosen for the analysis consisted of those discussed in Normandeau 2007a and in EPA's § 316(a) Determination, including Alewife, American Shad, smallmouth bass, largemouth bass,

[247] *See generally* AR-1352, Attachment 2 & Attachment 3.

[248] *See id.*, Attachment 2.

[249] *See id.*, Attachment 3 at 9-12.

[250] *See generally id.*, Attachment 2.

[251] These three periods were chosen as representative of the early spring period when river flows are high and ambient temperatures are relatively low, the late spring period when ambient temperatures are rising rapidly, and the mid-summer period when river temperatures are high and flows are low. *See id.* at 2-4.

[252] *See id.*, Attachment 3 at 2-8.

pumpkinseed, yellow perch, fallfish and white sucker.[253] Thermal benchmarks and lifestages expected to be present in lower Hooksett Pool during the above-referenced three time periods were considered. In EPA's § 316(a) determination, it did not address whether the amount of habitat exposed to elevated temperatures is large enough to adversely affect the population to which these species belong. In contrast, Dr. Barnthouse explicitly addressed the quantity of habitat that would be denied to each RIS population by exposure to a thermal plume (consistent with the pertinent inquiry—the effect on the BIP).[254]

Based on a conservative analysis of the CORMIX output, Dr. Barnthouse concluded that "the thermal plume from the Merrimack Station [does not] affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge" and, thus, "that Merrimack Station's thermal discharge has had no measurable impacts on the fish community in the Hooksett Pool."[255] As would be expected, the temperature of the water within the plume is highest at the point of discharge (Station S0) and declines as the plume dissipates and diffuses outward as it moves downriver. The overwhelming majority of Hooksett Pool remains at temperatures below the thermal tolerances of the RIS. Specifically, Dr. Barnthouse concluded:

> In none of the cases examined using the CORMIX model would the thermal plume from the Merrimack Station affect more than a negligible fraction of the fish habitat present downriver from the cooling water discharge. On average, 0.48% of the surface area and 0.19% of the habitat volume present between Station S0 and Hooksett Dam would be affected during the early spring period. For the late spring period, at most 0.27% of the surface area and 0.09% of the habitat volume present between Station S0 and Hooksett Dam would be affected. For the mid-summer period, at

[253] *See id.* Atlantic salmon was not included because the Merrimack River Atlantic salmon restoration program has been terminated. *See id.* at 1.

[254] *See id.* at 5-8.

[255] *Id.* at 7-8.

> most 3.47% of the area and 0.88% of the volume present between Station S0 and Hooksett Dam would be affected.[256]

As a result of the small proportion of the available habitat within the Pool that is influenced by the thermal plume, "measurable impacts on the fish community would not be expected and none have, in fact, been found."[257] As such, the thermal plume analysis supports the conclusion from the fish surveys reported by Normandeau[258] and analyzed by Dr. Barnthouse.[259] It would be improper for EPA to deny PSNH's request for a variance based on isolated temperature data points that cannot reasonably signify appreciable harm to the BIP.

5. Further Analyses of Shorter Term and Longer Term Exposure Temperatures Are Unnecessary

In its Statement, EPA invites comment on the question of how shorter term and longer thermal data should be factored into EPA's evaluation under § 316(a) and New Hampshire's water quality standards of the effects of Merrimack Station's thermal discharge on Hooksett Pool and the development of thermal discharge limits for the Merrimack Station permit. The Statement includes the following rationale for considering temperatures reached on only a single day out of a 21-year time series as being relevant to the permit:

> While considering long-term averages has utility for evaluating thermal discharge impacts, looking *only* at long-term averages would obscure more extreme conditions that fish and other aquatic life might be exposed to over shorter, but still biologically significant periods of time. For example, such shorter, but impactful periods could occur during the summer when the plant is in full operation during low river flow and high ambient temperature conditions. Such temperature and flow extremes would be masked by only considering the data averaged over the full 21-year period. Consequently, in response to PSNH's clarification of the data it had submitted, EPA is now also

[256] *Id.* at 7.

[257] *Id.* at 8.

[258] *See* AR-11; AR-871.

[259] *See* AR-1300.

> reevaluating the effects of shorter-term thermal conditions, particularly on species that may be especially sensitive to such temperature excursions in relation to their ability to survive and compete with more thermally-tolerant species.[260]

Because over forty-five years of analysis of the fish, shellfish and wildlife in Hooksett Pool demonstrates an absence of prior appreciable harm, analysis of the river temperatures, long or short term, can only provide a theoretical explanation for why Merrimack Station's thermal discharge has not caused appreciable harm to the Hooksett Pool BIP. Short term temperatures are even less relevant to a permitting decision for a number of reasons.

First, as explained in Dr. Barnthouse's Comments to EPA's Statement, for an exposure duration of only 24 hours, "the chronic thermal tolerance data relied on in most of EPA's thermal effects analyses are not relevant. Only data on acute lethality related to short-term exposures would be relevant to such an evaluation."[261] Dr. Barnthouse explains that "Upper Incipient Lethal Temperature (UILT) values have historically been the most common measures of acute thermal effects in fish"[262] and those values for the RIS are provided in Appendix C of Normandeau 2007a.[263] Dr. Barnthouse continues:

> None of the other values provided in Appendix C or other sources utilized by EPA would be relevant to an analysis of short-term exposures. Even the UILT values are of questionable relevance, for two reasons. First, the exposure durations in thermal mortality experiments are typically 4-7 days (EPRI 2011) and most likely understate temperatures that could be tolerated for a period of only

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[260] AR-1534 at 39-40. It was EPA's misinterpretation of the Normandeau data set that led to its incorrect application of the temperature data. EPA was not actually advancing such a conservative analysis in its 2011 Fact Sheet. In fact, in its Statement, EPA states that it "did not think that such single-day data would be particularly useful for assessing the effects of thermal discharges on the aquatic community." *Id.* at 39. Nevertheless, the agency has specifically sought comment in its Statement regarding whether such single-data can provide a useful metric in the § 316(a) analysis. *See id.* at 39-40. It does not.

[261] LWB 2017 Response at 3.

[262] *Id.* (referencing a report from the Electric Power Research Institute ("EPRI"), Thermal Toxicity Literature Evaluation, Report No. 1023095, Palo Alto, CA (2011) (hereinafter ("EPRI (2011)"). This 2011 EPRI report is attached hereto as Exhibit 10.

[263] AR-11, Appendix C.

> 24 hours. Second, the values themselves are strongly influenced by experimental conditions, especially acclimation temperature. EPRI (2011) found that UILT estimates for the same species can vary by 10°C or more depending on acclimation temperature. Evaluating the potential exceedance of these highly uncertain UILT values during rare, high-temperature events would not provide credible evidence for appreciable harm.[264]

Second, EPA ignores the fact that fish (except eggs and larvae) detect and simply avoid regions where temperatures are elevated to potentially harmful levels.[265] Dr. Barnthouse references EPRI's explicit recognition of this reality: "'It is important to note that none of the laboratory methods accurately reproduces what happens in the field where fish are exposed to spatially and temporally varying thermal fields and have the ability to select specific locations.'"[266] In fact, "'fish kills from heat are rare in nature and generally occur only when escapement is blocked or when the coolest water available to fish exceeds the lethal temperature or is deficient in oxygen.'"[267] These are not the conditions present in the vicinity of the Merrimack Station discharge, according to Dr. Barnthouse.[268] And, given the listed avoidance temperatures for the species at issue are equal to or lower than the corresponding UILTs,[269] it is safe to assume fish simply avoid the affected water during these rare events until the temperature declines to a more suitable level.[270]

Third, as discussed above with respect to the CORMIX modeling performed by Enercon and Dr. Barnthouse's analysis of the plume's effect on RIS, only a small fraction of the fish

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[264] LWB 2017 Response at 3-4.

[265] *Id.* at 4.

[266] *Id.* (quoting EPRI (2011)).

[267] *Id.* (quoting K.E.F., Hokanson, *Temperature Requirements of Some Percids and Adaptations to the Seasonal Temperature Cycle*, JOURNAL OF THE FISHERIES RESEARCH BOARD OF CANADA 34, 1524-1550 (1977)).

[268] *Id.*

[269] *See* AR-11, Appendix C.

[270] LWB 2017 Response at 4.

present in the Hooksett Pool would be exposed to the thermal plume from Merrimack Station. Even with respect to the mid-summer period—the one most relevant for addressing EPA's contention that "shorter, but impactful periods could occur . . . when the plant is in full operation during low river flow and high ambient temperature conditions"[271]—the plume affects only a minimal portion of Hooksett Pool where fish theoretically might be affected. As explained by Dr. Barnthouse:

> Enercon (2016) calculated the percent of the river area and volume between the mouth of the discharge canal (Station S0) and Hooksett Dam within which the plume temperature would exceed 80°F, 83°F, and 87°F. The two lower temperatures, 80°F and 83° would not have exceeded the UILT of any of the relevant species listed in Appendix C of Normandeau (2007b). The highest temperature, 87°F, exceeds the listed UILT for yellow perch, however at this temperature the plume includes only 0.02% of the area and 0.01% of the volume of the river between the discharge canal and Hooksett Dam. Since 87° F is within the range of avoidance temperatures listed for this species (79° F - 88°F), any yellow perch encountering this plume temperature would be expected simply to avoid it.[272]

Finally, any speculation that short-term high temperature exposures might impair the ability of thermally-sensitive species to survive and compete with more thermally tolerant species is disproven by the actual data from over many years of study of the fish communities present in the Hooksett, Garvins, and Amoskeag Pools of the Merrimack River. The actual data shows "there is no evidence that species with low thermal tolerances have been replaced by species with higher thermal tolerances."[273]

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[271] AR-1534 at 39-40.

[272] LWB 2017 Response at 5. The reference to Normandeau 2007b in the LWB 2017 Response refers to the report identified as Normandeau 2007a in these comments. Dr. Barnthouse identifies a report by its year of publication and, as necessary, the "a," "b," etc. nomenclature for reports authored in the same year. Whichever report appears first in his report receives the "a" designation, the second is designated as "b," and so forth. This designation method may not always match how PSNH has identified the same reports in these or previous comments submitted to EPA.

[273] *Id.*

6. Conclusion

PSNH appreciates EPA's reconsideration of the temperature data, which was previously misinterpreted and which misrepresentation led to an incorrect § 316(a) determination and denial of a thermal variance for Merrimack Station. The temperature data, when correctly interpreted, helps explain what 40+ years of actual biological data and analyses concerning the fish and macroinvertebrate communities, as well as New Hampshire water quality, already show—that Merrimack Station's thermal discharge has not caused appreciable harm to the BIP of Hooksett Pool, and the variance should be granted.

D. The Presence of the Asian Clam in Hooksett Pool Should Have No Bearing on EPA's Variance Determination Because the Clam Is Not Causing Appreciable Harm to the BIP

EPA seeks public comment concerning the presence and abundance of the Asian clam (*Corbicula fluminaea*) in Hooksett Pool and its implications for Merrimack Station's NPDES Permit.[274] The Asian clam is a non-indigenous, invasive species that was first identified in Hooksett Pool in 2011 by PSNH and its consultant, Normandeau, as part of Normandeau's analysis of macroinvertebrate data and its ultimate determination that Merrimack Station's thermal discharge has not caused appreciable harm to the shellfish and macroinvertebrate communities in Hooksett Pool.[275] As EPA acknowledges in its Statement, it was PSNH that advised EPA of the clam's presence in Hooksett Pool in 2012, through Normandeau's submissions in response to the 2011 Draft Permit.[276]

[274] *See* AR-1534 at 43.

[275] *See* AR-1174.

[276] *See* AR-1534 at 41. As explained in Normandeau's Comparison of Benthic Macroinvertebrate Data Collected from the Merrimack River near Merrimack Station (AR-1174) and in Normandeau's 2012 Comments (AR-1170), Normandeau's evaluation of Hooksett Pool's macroinvertebrate community in 2012 revealed an absence of prior appreciable harm to the BIP.

In its Statement, EPA remarks that it found the discovery of the Asian clam "worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the *presence* and/or *prevalence* of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating the Facility's thermal discharges under CWA § 316(a) and New Hampshire water quality standards."[277] As an initial matter, the mere *presence* or *prevalence* of the Asian clam in Hooksett Pool is irrelevant to the thermal variance analysis unless it is causing appreciable harm to the BIP of the relevant waterbody (*i.e.*, Hooksett Pool). As EPA made clear in its Fact Sheet to the 2011 Draft Permit, non-indigenous species historically not present in Hooksett Pool but that appear later in time should not be included in analysis of the BIP, except to consider how their presence has affected, if at all, the balanced indigenous community.[278] Indeed, EPA has granted § 316(a) variances where Asian clams and other invasive species were present in the relevant waterbody. For example, in 2014, EPA issued its Draft NPDES Permit to the Mount Tom Generating Station located in Holyoke, Massachusetts, approximately 90 miles from Merrimack Station.[279] EPA granted Mount Tom's request for a § 316(a) variance, despite the presence of a number of invasive species, including

[277] *Id.* (emphasis added).

[278] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

[279] *See* U.S. EPA, Region 1, Draft NPDES Permit No. MA0005339 for Mount Tom Generating Company, LLC (April 11, 2014) ("Mount Tom Permit"). This draft permit is attached hereto as Exhibit 11. After completing its analysis and finding that CCC would represent BAT for controlling thermal discharges at the Mount Tom facility, EPA "determined that it can grant a thermal discharge variance under CWA § 316(a) to authorize the thermal discharge limits proposed in the new Draft Permit for MTS" and that "thermal discharge limits based on technology and water quality standards would be 'more stringent than necessary to assure the protection and propagation of a [BIP] of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . . .'" *See id.*, Fact Sheet at 62 (quoting 33 U.S.C. § 1326(a)).

Asian clams, in the watershed, whose effect on fish populations was identified as "currently unknown."[280]

The Asian clam is ubiquitous, as the Statement notes,[281] and found throughout the United States near power plants and elsewhere. Asian clams are prolific up major waterways in the west (e.g., Columbia River, Sacramento Delta region), up the Mississippi and Ohio Rivers and their watersheds, and along the east coast in major harbors, rivers, and their various tributaries. The figure below shows the extent of the Asian clam's presence in the United States:

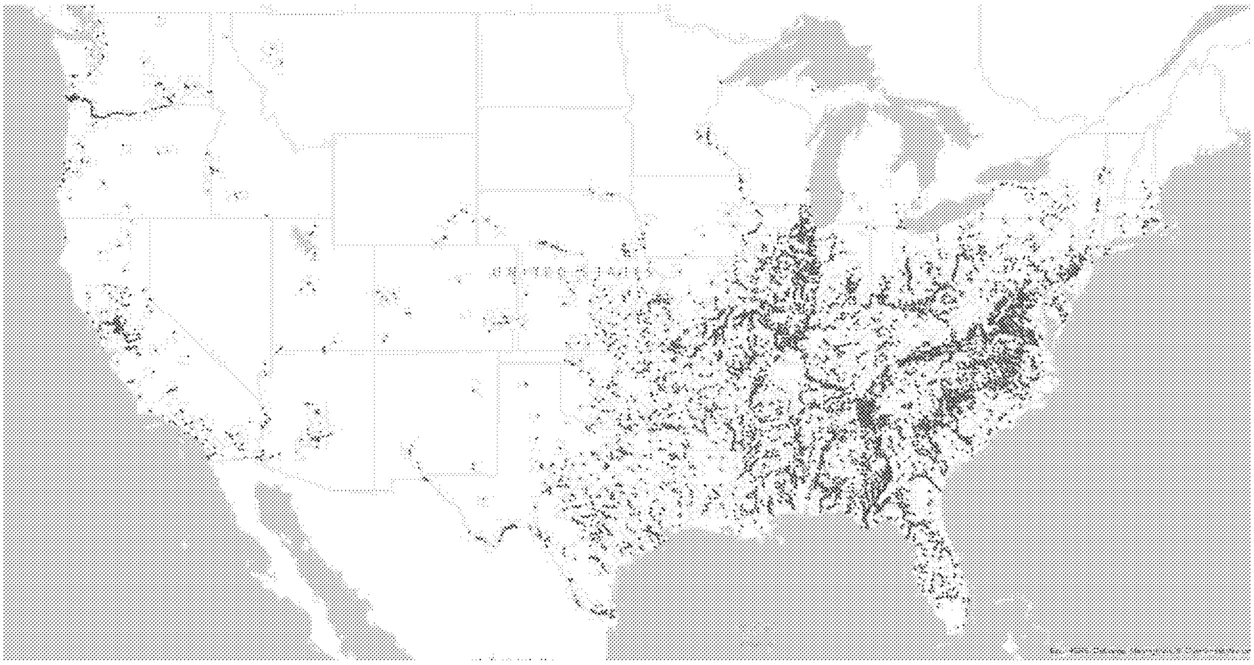

Figure - *Corbicula Fluminea* in the United States

[280] *See id.*, Fact Sheet at 60. EPA specifically provided that "a number of invasive species are known to exist in the watershed," including, specifically, Asian clams, and further noted that "[t]he potential for these species to affect anadromous and resident fish populations is currently unknown." *Id.*

[281] *See* AR-1534 at 41.

The red dots shown on the map represent Asian clam locations reported in the United States Geological Survey (USGS) database.[282] Further, the Asian clam is extensively found near power plants (shown in green):

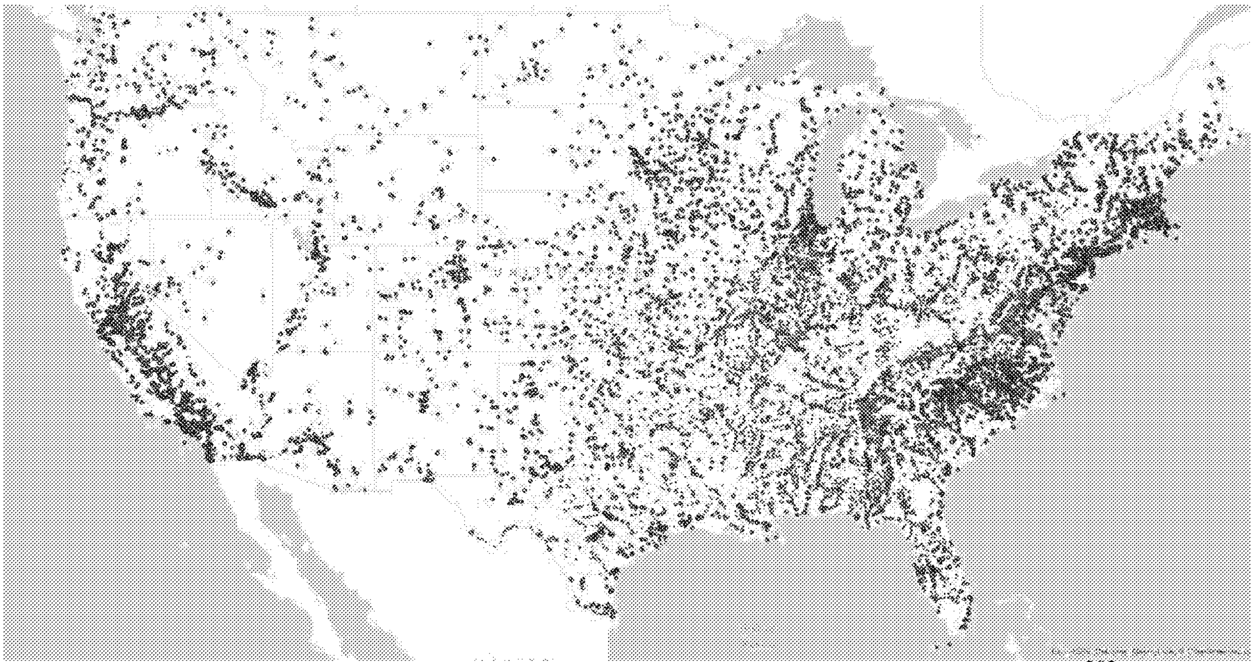

Figure - Overlay of Power Plants and Findings of *Corbicula Fluminea*[283]

Given EPA's silence concerning the Asian clam despite receiving the findings of Normandeau that Hooksett Pool hosts a healthy, BIP of fish and macroinvertebrates, PSNH did not anticipate EPA's interest in the Asian clam until learning of it by happenstance approximately three years ago. In 2014, PSNH observed EPA conducting dives, unannounced, with NHDES in the immediate vicinity of Merrimack Station. Near this same time period, EPA responded to several Freedom of Information Act ("FOIA") requests issued by PSNH concerning

[282] *See Nonindigenous Aquatic Species*, USGS, https://nas.er.usgs.gov/viewer/omap.aspx?SpeciesID=92 (last visited, October 31, 2017). ArcGIS was used here to plot their locations on a map of the United States.

[283] This figure overlays Asian clam locations (red dots) with power generating plants with a minimum output of 0.1 MW (green dots). Fuel sources include geothermal, hydro, solar (photo-voltaic residential installations not included), coal, nuclear, petroleum, natural gas, and bio-mass. The Energy Information Administration (EIA), a private organization funded by the Department of Energy to provide statistical data on the Energy Sector for public use, has compiled the location of every major power generating station in the U.S. This information is publicly available and can be overlaid on a map of the United States using ArcGIS. This figure shows the extent of energy generating infrastructure in the United States and Asian clam sitings reported in the USGS database.

the Merrimack Station permit proceeding.[284] Although EPA never mentioned its interest in the Asian clam to PSNH, its permit holder, documents contained within EPA's FOIA production made clear EPA had fixed its focus on the Asian clam, almost to the exclusion of other species. As a mounting number of documents from EPA's FOIA production focused on the Asian clam, PSNH grew concerned EPA might be considering a new basis to attempt to shore up the fatally flawed Draft Permit and its denial of PSNH's § 316(a) variance request that were based on EPA's erroneous determination that the polluted Merrimack River of the 1960s hosted a BIP and was the appropriate baseline for comparison.[285] Indeed, documents included in one of EPA's FOIA productions revealed that, in September 2015, EPA had contemplated a dive study for the purpose of assessing the Asian clam's effect on the Hooksett Pool BIP.[286] As explained in this "Project Plan" document, EPA sought to improve its "understanding of the power plant's influence on this invasive species" and, in turn, to "evaluate the plant's ability to meet state and federal water quality standards, and its NPDES permit requirements, as they apply to protecting the resident biological communities."[287] Among its study objectives, EPA planned to "assess the

[284] Despite the passage of time since the 2011 Draft Permit and the submission of substantial comments concerning the Draft Permit, EPA has not communicated with PSNH regarding the agency's position and has declined to have any substantive dialogue with PSNH concerning these permit proceedings. As a result, PSNH was forced to resort to FOIA requests for information on a periodic basis to determine EPA's consideration of the key issues in the Merrimack Station permit proceedings. Further, much of the information provided in response to these requests was heavily redacted or marked "deliberative process" or "attorney client privileged information." Aside from PSNH's suppositions about EPA's likely direction, PSNH had no definitive information regarding EPA's position until the Statement, which speaks to only some of the issues.

PSNH respectfully requests that the documents produced to PSNH in response to its numerous FOIA requests be added to the administrative record for this permit proceeding.

[285] These concerns are legitimized by EPA's Statement, which without citation or attribution, states "[t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality." AR-1534 at 42. The suggestions and implications that arise from unsubstantiated assertions of that nature, or that are encouraged to arise from them, imperil reasoned policy-making or defensible rulemakings.

[286] *See* U.S. EPA, Draft Quality Assurance Project Plan-"Qualifying the density of Asian clams (*Corbicula fluminea*) within and beyond the influence of the thermal discharge of a power plant" (2015) ("Project Plan"). This document is attached hereto as Exhibit 12.

[287] *Id.* at 3.

abundance of *Corbicula* relative to native epifaunal and infaunal macroinvertebrates," in addition to "*Corbicula's* capacity to displace native invertebrates, including mussels."[288] However, EPA's study plan was abandoned and the evaluation was never undertaken.[289]

Given PSNH's concerns arising from EPA's apparent interest in the Asian clam and its undisclosed dive efforts near the Station, PSNH engaged AST Environmental, an environmental consulting firm staffed by freshwater biologists, scientists, and researchers with extensive knowledge and experience in marine ecologies, including those inhabited by non-native species such as the Asian clam. Dr. Terry Richardson, a leading expert malocologist with AST with extensive knowledge concerning the Asian clam, evaluated the Asian clam's presence in Hooksett Pool, and specifically, its relationship to the Pool's BIP. AST (in conjunction with Normandeau) conducted dive surveys in Hooksett Pool, upstream and downstream of the discharge in the Merrimack River, and in various other water bodies in New Hampshire, in accordance with strict dive protocols and scientifically accepted sampling methodologies (in contrast to EPA's limited informational dive activities in 2013 and 2014). In addition to analyzing the limited data from EPA's own dive efforts in 2013 and 2014, and conducting comprehensive research into the Asian clam's northward expansion in the United States and other parts of the world, Dr. Richardson specifically examined the effect of the clam in Hooksett Pool on other native invertebrates, and, in doing so, answered the question considered by EPA in its abandoned 2015 study plan. The results of this extensive study and investigation are contained in the attached report titled, "The Asian clam (*Corbicula fluminea*) and its relationship to the balanced indigenous population ("BIP") in Hooksett Pool, Merrimack River, New

[288] *Id.* at 4.

[289] *See* AST Report at 3, 33-34.

Hampshire"[290] As detailed in AST's report, a comparison of the Asian clam to native bivalve populations in Hooksett Pool and upstream of the discharge in the Merrimack River, using various EPA-approved metrics and indices, demonstrates the Asian clam has not caused appreciable harm to Hooksett Pool's BIP, and may, in fact, be positively benefitting the ecosystem of the Pool.[291]

In addition to Dr. Richardson's investigation and analyses, PSNH engaged Dr. Robert McMahon, one of the country's leading experts on Asian clams. EPA no doubt is familiar with Dr. McMahon, whose research concerning the Asian clam is referenced in EPA's abandoned 2015 study plan. Dr. McMahon peer reviewed the AST Report and confirmed its conclusions, in addition to reviewing the available literature concerning the Asian clam and its impact on native bivalve communities.[292] As discussed in these comments, Asian clams are gaining a foothold in numerous parts of New Hampshire and in northern latitudes at sites with no thermal influence, as they have done throughout the world, often introduced by boating and recreational fishing transporting clams from one waterbody to another.[293] Importantly, the Asian clam's northern expansion into areas not impacted by a thermal influence supports its ability to survive in colder climates than originally believed. Further, apart from some speculation and conjecture that has arisen from the frequently high population abundances achieved by Asian clams through its reproductive capacity, there is no credible evidence to support Asian clams causing harm to other native bi-valves and macroinvertebrates.[294] Dr. McMahon confirms the conclusions of AST that

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[290] *See generally* AST Report.

[291] *See, e.g., id.* at 2-3. All bivalves, including the Asian clam, are considered ecosystem engineers (i.e., organisms that can physically modify the environment in a positive way), improving substrate for epibionts, refuge from predation, reducing physical or physiological stress, and otherwise stabilizing the environment.

[292] *See* McMahon Review at 2, 8.

[293] *See, e.g.*, AST Report at 8-12; McMahon Review at 2-3.

[294] *See, e.g.*, AST Report at 36-41; McMahon Review at 3-8.

the Asian clam has not caused and is not likely to cause appreciable harm to the BIP in Hooksett Pool.[295]

Further, PSNH also is including with these comments the results of Computational Fluid Dynamics ("CFD") Modeling by Enercon Services,[296] which illustrate that thermal discharges from Merrimack Station do not materially influence the bottom of the Hooksett Pool, where the Asian clam population is located.[297] Given the demonstrated ability of Asian clams to survive throughout New Hampshire and northward in areas without thermal influence, the draconian requirement of CCC would not assure the Asian clam's removal from Hooksett Pool. In addition to substantial uncertainty concerning the effect CCC would have on the Asian clam's presence and abundance in Hooksett Pool, identification of the Asian clam in the Pool does not equate to harm to the Pool's BIP. To simply equate presence with harm absent evidence of any impact to native species would be arbitrary, capricious, and contrary to law.

1. The Asian Clam Is Spreading Northward to Areas Unimpacted by Thermal Influence

In its Statement, EPA invites comment concerning several articles pertaining to the Asian clam's distribution throughout the United States and suggestions that the thermal influence is necessary for Asian clams to survive in colder climates such as the Connecticut River (Connecticut) and St. Lawrence River (Canada).[298] However, a review of the literature and the known range expansion of the Asian clam northward into areas lacking thermal influence (including New Hampshire) call into question any conclusion that thermal influence is necessary for the clam's survival in the Merrimack River.

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[295] McMahon Review at 8.

[296] *See* Enercon 2017 Comments, Attachment 5.

[297] *See* AST Report at 51-53.

[298] *See* AR-1534 at 42.

Originally native to Southeast Asia, the Asian clam has spread worldwide over the course of the last century and reached such new habitats as North and South America, Europe, Africa, and the Pacific Islands.[299] First reported in Western Europe in the 1980s, Asian clams are now fairly widespread throughout Europe. Current reports now show the Asian clam distribution as far north as 53.9426°N in Ireland, 52.6261°N in the Netherlands, 52.3828°N in Germany, and at 53.3748°N in Poland.[300] Although Asian clams have been found in waters associated with thermal discharges from power plants and other sources, studies in Europe reveal the clam's northward and westward expansion has occurred independent of thermal discharges in the Vistula River, Kraków, Poland, and in the Crisuri and Danube Rivers and associated tributaries in Hungary.[301]

Similarly, in the U.S. and Canada, northward range extension has occurred into areas with low water temperature lacking thermal discharge influence in Lake Pend Oreille, Idaho; St. Croix River, Minnesota; Michigan River, Michigan; Lake George, Lake Champlain and Erie Canal system, New York; Gildersleeve Island, Connecticut River, Connecticut; and Long, Wash, and Cobbetts Ponds, New Hampshire.[302] In North America, live Asian clams were first documented in 1938. By 1953, the clams had spread throughout much of the U.S., especially the Southeast.[303] The Asian clam now can be found in most of the lower 48 states of the U.S., including Hawaii, three of the Great Lakes (Erie, Michigan, and Superior), and the St. Clair River in Michigan.[304] Asian clams have spread north to areas of milder winters and water

[299] AST Report at 8.

[300] *Id.*

[301] *Id.* at 10.

[302] *Id.* at 10-11.

[303] *Id.* at 8.

[304] *Id.*

temperatures such as Lake Whatcom, Washington, and Vancouver Island, British Columbia, the Asian clam's northern-most North American locations, and have recently been found in northern latitudes in North America with low water temperatures and ice formation.[305]

In its Statement, EPA writes, "[w]hen PSNH submitted its report in 2012, the presence of Asian clams in New Hampshire had only been documented in the Merrimack River south of Bow, New Hampshire, and in Cobbetts Pond, in Windham, New Hampshire, according [to] NHDES' environmental fact sheet on Asian clams (NHDES, 2012)."[306] In fact, Asian clams were detected in the Merrimack River 25 miles downriver of Merrimack Station in 2007; four years later, in 2011, Asian clams were reported in Hooksett Pool.[307] Although there is no evidence of any one particular cause of the Asian clam's arrival at Hooksett Pool, it is likely that recreational boating or fishing, at a time when the clam was spreading throughout New England, is responsible for the clam's introduction to Hooksett Pool and other locations throughout New Hampshire.[308] In addition to Cobbetts Pond and Long Pond, Asian clams have been identified in New Hampshire's upper Merrimack River, above the city of Concord.[309] This location is well upstream of Merrimack Station and lacks thermal influences.[310] Additionally, Asian clams have been reported at two other sites in Hooksett Pool upstream of Merrimack Station, as well as in New Hampshire's Beaver Lake, Great Pond, Canobie Lake, and Little Island Pond.[311] None of

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[305] *Id.*

[306] AR-1534 at 41.

[307] AST Report at 22.

[308] *Id.*

[309] *Id.* at 11.

[310] *Id.* at 28, 30.

[311] *Id.* at 11.

these sites experience thermal influence – and yet they are home to Asian clam communities.[312]

As explained by Dr. McMahon:

> These data strongly suggest that thermal effluents are not required to support sustainably reproducing Asian clam populations in New Hampshire water bodies. They also suggest that Asian clams do not require a thermal refuge to invade and thrive in New Hampshire water bodies as corroborated by a report that Asian clam populations have been found at 24 cold winter water sites in the Arkansas, Colorado, Platte, and San Juan River Basins of Colorado not receiving thermal effluents (Cordeiro et al. 2007). The Colorado water bodies and rivers supporting Asian clam infestations were at high altitudes (i.e., 1,200 to 3,200 m) where they were exposed to extremely low winter temperatures. Asian clams have also become established in Lake George, NY, which ices over every winter (Young and Wick 2017). A sustainably reproducing Asian clam population occurs in the Clinton River, Michigan, where ambient water temperatures range from 0-2°C for most of the winter (Janech and Hunter 1995). Further, an Asian clam population established in a section of the lower Connecticut River in 1990 impacted by thermal effluent discharge from the Connecticut Yankee Nuclear Power Station continued to thrive at similar densities after the Power Station was closed in 1997 and ceased to release thermal effluents (Morgan et al. 2004).
>
> Asian clams were first discovered in Europe in 1980 in the Bass Dordogone, France, and Tage Estuary, Portugal (Mouthon 1981). They have since spread throughout Europe extending west into Germany, Poland, Ukraine and Romania (DAISIE 2017) where they have invaded freshwater habitats with very low winter ambient temperatures (Müller and Baur 2011). In a laboratory study (Müller and Baur 2011), small and large winter-conditioned specimens of Asian clam were exposed to constant water temperatures of 0° and 2°C for a period of nine weeks while recording their mortality weekly. Clams had a high level of survival (>80%) during the first four weeks of exposure to ether 0° or 2°C after which mortality rapidly increased with further exposure time. However, some larger individuals (17.5%) survived the full 9 weeks of exposure. Overall, large individuals were more cold tolerant than small individuals (Müller and Baur 2011). Since water temperatures in northern temperate lotic systems do not remain at or below 2°C throughout the winter, including the Merrimack River, NH, this result explains the

[312] *Id.* at 49.

> survival of Asian clam populations in areas of that river not receiving thermal effluents as noted in the AST Environmental report.[313]

A study conducted jointly by EPA and NHDES in 2013 that examined range extension by Asian clams in New Hampshire sheds further light on the Asian clam's relationship to (or lack of need of) thermal discharges. AST's correct interpretation of the data from the EPA-NHDES study found no significant difference in Asian clam densities among the four New Hampshire sites surveyed: two sites with no thermal effluent, Cobbetts Pond and Long Pond; and two sites receiving Merrimack Station cooling water release, Hooksett Pool and Amoskeag Pool.[314] In fact, while there was no statistical difference among locations, the pattern actually suggests lower Asian clam densities at Hooksett Pool (with its thermal input from the station) rather than at the sites without thermal input (Cobbetts and Long ponds).[315]

Surveys and studies such as the ones discussed above, coupled with the results of CFD modeling of Hooksett Pool, disprove that presence of the Asian clam in Hooksett Pool is attributable to Merrimack Station's thermal discharges. CFD modeling simulates complex scenarios involving fluid flow, heat transfer, and interaction with surfaces.[316] CFD simulation is able to incorporate turbulent flow conditions of the river and cooling water canal effluence along with heat transfer and the thermal and density properties of the ambient river and cooling water discharge to model the dynamics of the thermal plume as it interacts with the river bottom. To help assess the questions at hand, Enercon developed a CFD model using ambient river temperature upstream of Merrimack Station, temperature of the station's cooling water discharge

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[313] McMahon Review at 2-3.

[314] AST Report at 26-29.

[315] *Id.* at 30.

[316] *See* Enercon 2017 Comments, Attachment 5 at 2-3.

canal, flow of the discharge canal, and flow of the river as input parameters.[317] The modeling shows the extent to which the cooling water discharge plume into Hooksett Pool provides for >2°C water at the river bottom during winter operations of Merrimack Station.[318]

The resulting CFD models of the thermal plume from Merrimack Station into Hooksett Pool indicate the thermal influence of cooling water discharge: (1) minimally impacts the bottom where Asian clam and other invertebrates live, and (2) perhaps more importantly, does not elevate ambient river temperatures above the 2°C minimum threshold for Asian clam survival at station S4 and further downstream.[319] These locations are relevant because S4 and further downstream S17 are the two sites with the highest Asian clam abundances in Hooksett Pool.[320]

Using monthly averages (2010-2017) of cooling water canal temperature at the mouth of the canal, cooling water canal discharge flow, and river flow with an assumed ambient river temperature input of 33°F (0.6°C) in the model, it was clear that, by 950 ft. downstream of the canal:

- In the month of December, the thermal influence at the river bottom was minimal, and river temperatures did not exceed 34°F (1.1°C) in December.
- In the month of January, bottom contact by the thermal plume was negligible and temperatures did not exceed 34°C (1.1°C).
- In February, bottom contact was practically nonexistent and temperature did not exceed 33.5°F (0.8°C).

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[317] *See generally* Enercon 2017 Comments, Attachment 5.

[318] *See id.*; AST Report at 51-53. Asian clams are thought by many to have a 2°C minimum thermal tolerance limit that excludes them from cold water habitats; although, as recognized by NHDES, recent research concerning Asian clam presence in Lake George, New York, suggests clams may survive even lower temperatures for sustained periods of time. *See also* AR-1408.

[319] AST Report at 53. Survey points in Hooksett Pool and the Merrimack River are designated alpha-numerically. S0 is the reference point/survey location at Merrimack Station, the prefix "N" or "S" designates whether the survey point is, respectively, north (upriver) of the station or south (downriver) of the station, and the number indicates the number of 500-foot increments from S0. Thus, Site S4 is 2,000 feet south of the Station.

[320] *Id.* at 44.

- In March, bottom contact was minimal and temperatures did not exceed 33.75°F (1.0°C).[321]

Thus, under average operation and river flow conditions, the thermal release from Merrimack Station does not elevate river temperatures above the 2°C minimum tolerance limit of Asian clams, yet the two sites with greatest clam abundances in 2014, and 2016 occur 2,000 ft and 8,500 ft downstream of the canal at S4 and S17, respectively.[322]

Recent published findings, as discussed later in these comments, suggest the successful tolerance of Asian clams to cold water, as well as their northward spread, may also be due to the previously unrecognized genetic and physiological capacity of Asian clam to tolerate colder temperatures combined than previously thought.[323] Numerous scenarios exist—including in New Hampshire—where clam populations survive without relying on thermal discharges to provide an artificial heat influent to their habitat. And every such scenario negates EPA's insinuation that clams cannot survive in New Hampshire but for thermal discharges. A wide range of scientific studies and literature increasingly question the "conventional wisdom" of the clam being unable to survive the winters of northern latitudes without thermal discharges warming the otherwise cold waters.[324]

Indeed, as explained by Dr. McMahon:

> [D]ata and reports of thriving Asian clam populations in New Hampshire, Connecticut, Colorado and northern Europe (as

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[321] *See generally* Enercon 2017 Comments at 25-34.

[322] AST Report at 52-53.

[323] *See, e.g., id.* at 17.

[324] *See generally* AST Report at 18. "For example, in a study conducted in the northeastern United States, researchers concluded '[t]he importance of [Connecticut Yankee] thermal discharge as a refuge for *Corbicula* survival in the Connecticut River during cold winters appears minimal.'" Furthermore, another study cited human population density rather than temperature as being a more important factor than thermal discharge in Asian clam densities and establishment. Looking at Asian clams on the St. Lawrence River, it concluded that, "'[p]opulation densities [of Asian clam] did not differ between natural and artificially heated waterbodies in the Americas . . . '" and, "'[t]he probability of establishment in North American rivers was positively correlated with human population density in the basin…'" *Id.*

> described above) strongly suggest that even if the release of thermal effluents from the Merrimack Station into Hooksett Pool ceased, its Asian clam population would continue to exist because it appears to be tolerating ambient winter water temperatures below 2°C as are Asian clam populations upstream and downstream of the station's localized thermal effluent plume. Further, the Asian clam's extremely high reproductive and growth rates (McMahon 1999) would allow replenishment of any winter clam mortality during summer months by the indigenous population as well as by settlement of juvenile clams hydrologically transported (McMahon 1999) into Hooksett pool from populations upstream of the Merrimack Station. Moreover, if cooling tower basins are used to replace the existing once-though cooling system at Merrimack Station, the winter thermal refugia associated with the warm water in such cooling towers and blowdown discharge of warm water from cooling tower basins into Hooksett Pool would likely support Asian clam reproductive efforts (Post et al. 2000).[325]

"Taken as a whole, these studies and the data provided in the AST Environmental report strongly suggest that Asian clams are capable of sustaining populations under very cold conditions in the Northeastern United States, belying previous laboratory studies indicating that they could not survive continuous exposures to ambient water temperatures ≤ 2.0°C."[326]

EPA's Statement refers to two peer reviewed journal articles by Simard (2012) and Morgan (2003) for their study of the relationship between Asian clams and thermal discharges from power plants.[327] According to EPA, "[b]oth studies, one conducted in the Connecticut River (Connecticut) and the other in the St. Lawrence River (Canada), found that higher winter survival rates of Asian clams occurred within the influence of the power plants' thermal discharge than in ambient areas, and that the elevated temperatures appeared to affect the clam's reproductive success, growth, and abundance."[328] While EPA's statement about the contents of

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[325] McMahon Review at 3.

[326] *Id.* (citation omitted).

[327] AR-1534 at 42.

[328] *Id.* (citing AR-1404 and AR-1405).

these articles is generally true, EPA failed to examine a third, important and relevant peer-reviewed journal article that studied the relationship between Asian clams and thermal discharges from a power plant. Morgan (2004)[329] produced a more extensive follow-up monograph to the Morgan (2003) paper, cited by EPA, expounding on its original conclusions. After providing a more thorough examination of the relationship between the Connecticut Yankee ("CY") power plant (Connecticut River) and the Asian clam's population dynamics as well as the Asian clam's interactions with other native bivalve species, Morgan (2004) states, "[t]he importance of CY thermal discharge as a refuge for [Asian clam] survival in the Connecticut River during cold winters appears minimal."[330] Morgan (2004) adds, "[a]dditional evidence that the CY discharge was not necessary for survival of [Asian clam] populations in the Connecticut River is apparent when [Asian clam] abundance during CY operation (1991- 1996) was compared to abundance following the plant closure (1997-2000). Following closure of the CY power plant in 1996, the abundance of [Asian clams] at all sites was not significantly different than during the operational period."[331] Finally, Morgan (2004) concluded that ". . . . annual densities during plant operation . . . were not significantly different from those following the plant closure . . . . This suggests that the CY thermal discharge did not serve as an important refuge area for [Asian clams] overwintering in the vicinity of the plant."[332]

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[329] D.E. Morgan, M. Keser, J.T. Swenarton, & J.F. Foertch, *Effect of Connecticut Yankee Power Plant on Population Dynamics of Asiatic Clams and Their Interactions with Native Bivalves*, AMERICAN FISHERIES SOCIETY MONOGRAPH 9, 419-439 (2004). Hereinafter, references to this document will be cited as "Morgan (2004)." This journal article is attached hereto as Exhibit 13.

[330] *Id.* at 435 (emphasis added).

[331] *Id.*

[332] *Id.* at 436 (emphasis added). The findings at CY following removal of the thermal discharge call into substantial question the effect, if any, that CCC would have on the Asian clam's presence and abundance in the Merrimack River. Indeed, AST noted that the operation of wet evaporative cooling towers used in power stations, usually bring make-up water from a raw-water source to replace evaporated water lost to the evaporative cooling process and discharge (blow down) some water from their basins back to the raw water source to prevent excessive concentration of dissolved solids. *See* AST Report at 164, Appendix D. Juvenile clams can be drawn into the basins

These statements indicate that Morgan (2004) did not find the thermal discharge was necessary for Asian clam overwintering in the Connecticut River. The Lake George, New York, Asian clam population thriving in iced-over waters during winter is a better example that thermal discharge is not necessary for an Asian clam winter refuge,[333] as are the high altitude ice-covered sites in Colorado.[334] The relevance of the findings of such a thorough follow-up, peer-reviewed study and other similar studies and information undermine EPA's reliance on Simard et al. 2012[335] and Morgan et al., 2003[336] for the suggestion that Merrimack Station is responsible for the presence of the Asian clam in Hooksett Pool.[337] An examination of the Asian clam's physiology, as studied and articulated by various scientists and biologists, helps to explain the species' presence and abundance in colder habitats—and debunks overly-simplified linkages between thermal discharges and clam populations.

First, the Asian clam is a self-fertilizing, highly fecund, hermaphroditic species that typically reproduces twice a year.[338] During these reproduction events, as many as 3,000 juveniles can be released per clam per day and, as a result of the species' high feeding (filtration) rate and relatively high allocation of non-respired energy toward growth, the Asian clam matures

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of such cooling towers with make-up water where they grow to adults producing juveniles that can be discharged back into source waters to become adults. *Id.* Thus, cooling towers become refuges for Asian clams from which juveniles are produced to be carried out on discharge water to re-infest the raw water source. *Id.* In fact, Asian clam fouling of wet cooling towers is well documented. *Id.*; *see also* McMahon Report at 3 (providing that "the winter thermal refugia associated with the warm water in . . . cooling towers and blowdown discharge of warm water from cooling tower basins into Hooksett Pool would likely support Asian clam reproductive efforts (Post et al. 2000)").

[333] *See* AR-1404.

[334] J.R. Cordeiro, A.P. Olivero, & J. Sovell, *Corbicula fluminea (Bivalvia: Sphaeriacea: Corbiculidae) in Colorado*, THE SOUTHWESTERN NATURALIST 52(3), 424-430 (2007). This journal article is attached hereto as Exhibit 14.

[335] AR-1404.

[336] AR-1405.

[337] Appendix D to AST's Report addresses the specific items in the administrative record EPA mentions in its Statement (*see* AR-1534 at 43-44) related to the Asian clam and added after closure of the public comment period for the 2011 Draft Permit. *See generally* AST Report, Appendix D.

[338] AST Report at 12.

relatively rapidly.[339] Such characteristics fuel the clam's ability to spread into new habitats,[340] and, as noted previously, such spread is occurring worldwide into habitats devoid of thermal discharges.

Second, adequate dissolved oxygen ("DO") levels are important for the Asian clam, and the Asian clam is among one of the least hypoxia (*i.e.*, low dissolved oxygen) tolerant freshwater bivalve mollusks.[341] This factor, rather than thermal influences, could partially account for prevalence of the clam in well-oxygenated shallow water habitats (such as Hooksett Pool).[342] Recalling EPA is of the stated opinion that "thermal discharges may substantially alter the structure of the aquatic community by . . . reducing levels of [dissolved oxygen],"[343] it seems incongruent that a DO-reducing thermal plume is essential to the Asian clam's survival.

Third, pH parameters can also impact Asian clams as evidenced by several studies. A study in North Carolina's Roanoke River established that a pH range of between 6.1 and 6.6 was important in explaining variation in Asian clam density and biomass among different sites, a study of the blackwater Ogeechee River in Georgia suggested that it was a stressful environment for Asian clams owing, in part, to the river's low pH, and a 2002 laboratory study demonstrated biomarker responses indicative of stress in Asian clams held briefly at pH's of 4.0-5.0 and 8.0-9.0.[344] The implication here is that acceptable pH levels in a waterbody, rather than a thermal influence thereon, may be a key factor in whether the Asian clam can or will continue to propagate in such waters.

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[339] *See id.* at 12-14.

[340] *See id.* at 16-17.

[341] *Id.* at 18.

[342] *Id.*

[343] U.S. EPA, Environmental and Economic Benefits Analysis for Proposed Section 316(b) Existing Facilities Rule, EPA 821-R-11-002, at 2-12 (March 28, 2011).

[344] AST Report at 19.

Fourth, low calcium levels can also negatively affect Asian clam biomass and densities.[345] Conductivity and salinity are also important variables in determining *C. fluminea* abundance and biomass.[346] Again, the implication here is that acceptable calcium, conductivity, and salinity levels in a waterbody, rather than thermal influences, may, like dissolved oxygen and pH levels, be controlling factors in the Asian clam's establishment and survival in a given waterbody.

Fifth, "[f]ood availability is another very important environmental variable for the Asian clam. As filter feeders, Asian clams feed on a variety of suspended particles including bacterioplankton, phytoplankton and seston . . . ."[347] Food availability, therefore, could well be a controlling factor in a particular waterbody regardless of thermal influence.

The composition of the lake or river bottom, *i.e.*, the substrate, is yet another important habitat component for the Asian clam.[348] Although *Corbicula fluminea* inhabits nearly all substrate types where other habitat requirements are met (an adaptability that is likely a contributing factor in its global spread), the Asian clam displays a preference for certain substrate types and is found more abundantly in some substrates than in others—notably fine sand as preferred over coarse sand, sand without organic matter over sand containing organic matter, and any particulate substrate over a solid substrate.[349] As explained in the AST report:

> Newly released juvenile clams preferred course sand over mud or bare concrete (Sickel and Burbank 1974). Furthermore, clams grew best in sand rather than gravel, clay or solid substrata (Halbrook 1995). Similarly, field studies have shown clam abundances to be higher in fine sand over coarser material in the New River, VA,

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[345] *Id.*

[346] *Id.*

[347] *Id.*

[348] *See id.* at 20-21.

[349] *Id.* at 20.

> Roanoke River, VA, and Rhine River, Switzerland (Belanger *et al.* 1985; Cooper 2007; Schmidlin and Baur 2007). Although Asian clams are known to use pedal feeding in substrata containing some organic matter (Majdi *et al.* 2014), substrata relatively high in organic matter (*e.g.*, mud and "muck"), clays and detritus-rich sediment tend to have a negative effect on clam abundance, likely due to pore water hypoxia (Belanger 1991; Belanger *et al.* 1985; Cooper 2007). The importance of substratum type to Asian clam population dynamics and success is further emphasized by the clams displaying an increased stress response in the form of biomarkers and elevated metabolic rates when unable to burrow (Belanger 1991; Vidal. *et al*, 2002).[350]

In summary, there are a number of variables capable of contributing to the presence or absence of Asian clams in a given water body. As Dr. McMahon concluded in 2002, Asian clams have relatively low physiological resistance.[351] To link the Asian clam's presence in Hooksett Pool solely to the introduction of thermal discharges would be "scientifically unsound" and attribute a physiological fortitude to the clam that scientists do not recognize.[352] Many different abiotic requirements must be met to support the presence of Asian clams. The Asian clam's demonstrated ability to survive low winter temperatures in North America and northern Europe, the likelihood it may find warm water refuges even in a CCC system, the rapid growth rates of Asian clams after downstream settlement, and warming of ambient water temperatures in northeastern U.S. waterways have been identified as just a few of the reasons why it is unlikely that elimination of the thermal effluent from Merrimack Station would eliminate Asian clams from Hooksett Pool.[353] Such considerations are worth careful contemplation given the questions raised by the CFD modeling analysis.

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[350] *Id.* at 20-21.

[351] *Id.* at 21 (citing McMahon 2002).

[352] *Id.*

[353] McMahon Review at 8-9.

2. Careful Review of the Literature (and the Evidence) Reveals the Absence of Prior Appreciable Harm Resulting from Presence or Abundance of the Asian Clam in the Water Bodies They Inhabit

Although EPA's Statement seeks comment concerning whether Merrimack Station's thermal influence is causing or contributing to the presence or abundance of the Asian clam, even assuming some, unknown impact on the clam, the question for purposes of NPDES permitting is whether the Asian clam is causing appreciable harm to the Hooksett Pool BIP. It is not. Despite some speculation and conjecture associated with the frequently high population abundances achieved by Asian clams, there is no support for the supposition that Asian clams have impacted abundance and diversity of native bivalves in general, and unionids specifically, in North America.[354] As explained by Dr. Richardson:

> Despite the occurrence and recitations of such suppositions and misleading statements, the degree to which the Asian clam causes appreciable damage to the BIP, however, remains largely speculative, anecdotal, rarely quantitative, and largely scientifically unsubstantiated. Most touted negative impacts of Asian clams on the ecosystem they invade have simply not been scientifically confirmed or validated. When referring to effects on native bivalves, for example, Strayer (1999) subsequently states, "[u]nfortunately, the evidence for *Corbicula*'s impacts is weak, so its role…is <u>unresolved</u>," (emphasis added) and Vaughn and Hakenkamp (2001) point out, "[t]he invasion of *Corbicula* has been <u>speculated</u> to have negatively impacted native bivalve abundance and diversity in North America" (emphasis added). Still more recently, Ilarri and Sousa (2012) conclude for ecological impacts that, "[t]he majority of these effects remain <u>speculative</u> and <u>further research is needed</u> to clarify these interactions" (emphasis added).[355]

Indeed, as EPA itself recognized in granting Mount Tom's request for a § 316(a) thermal variance in 2014 for its Mount Tom Generating Station in Holyoke, Massachusetts, on the

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[354] AST Report at 42.

[355] *Id.* at 37-38.

Connecticut River, only 90 miles away from Merrimack Station, the potential for Asian clams to affect other species is largely unknown:

> [A] number of invasive species are known to exist in the watershed. Some have been introduced to the Connecticut River watershed inadvertently by humans, while others have been purposefully introduced. These species include non-native fish, common reed, purple loosestrife, Eurasian milfoil, water chestnut, mute swans, <u>Asiatic clams</u>, and wooly adelgids. <u>The potential for these species to affect anadromous and resident fish populations is currently unknown</u>.[356]

Dr. McMahon also observed that the postulated impacts of Asian clams on unionids have not been supported by empirical studies:

> Indeed, as indicated in the AST Environmental report and my own extensive literature search for this review, there appears to be scant published empirical evidence for negative impacts of Asian clams on native unionids and other freshwater bivalves. Thus, the main empirical reports of negative impacts of Asian clams on native unionid mussels have involved reported declines in unionid densities after Asian clam invasion of their habitats (Gardener et al. 1976, Sousa et al. 2005, Cordeiro et al. 2007). However, these reports are observational and did not ascertain the actual interaction with Asian clams that caused the observed native mussel density declines. Fuller and Richardson (1977) described Asian clams potentially dislodging native unionids from the substratum in the Savannah River (Georgia and South Carolina) but did not observe actual unionid dislodgement or unionid mortality resulting from it.
>
> In contrast, most empirical studies have found no negative impacts of Asian clams on native unionid mussel or sphaeriid populations supporting the observation of no impact in the AST Environmental report. For example, Asian clams were first documented in the Connecticut River near the Connecticut Yankee Power Station in 1990. When sampled along with native unionid mussels and sphaeriid clams from 1991-2000, no significant trends in unionid, sphaeriid or Asian clam abundance occurred across the entire sampling period including when the plant was operational and generating a thermal effluent during 1991-1996 and after it was shut down from 1997-2000 suggesting that Asian clam invasion

[356] Mount Tom Permit, Fact Sheet at 60 (emphasis added).

> had not negatively impacted either the unionid or sphaeriid communities (Morgan et al. 2004). In a study of 30 stream reaches in eight rivers in the Ouachita Highlands of central and western Arkansas and eastern Oklahoma, Vaughn and Spooner (2006) found that, when measured at the entire site scale rather than as separate quadrates, Asian clam densities were not significantly correlated with mean unionid mussel densities ($p = 0.95$) or biomass ($p = 0.76$) indicative of no Asian clam impact. Similarly, Leff et al. (1990) in a study of bivalve distribution and abundance in 79 perpendicular transects separated by 100 m along a stretch of a backwater stream tributary to the Savannah River, found no significant correlation between the densities of Asian clams and the unionid, *Elliptio complanata*. Instead, their densities across sites appeared to vary independently from each other. These three empirical studies have all indicated that Asian clam infestations do not impact either sphaeriid or unionid density or biomass (BIP) including that of the unionid species, *E. complanata* that was also found not to be impacted by the presence of Asian clams in Hooksett Pool by the AST Environmental study.[357]

Similarly, based on his extensive review of the literature concerning the effects of the Asian clam on benthic macroinvertebrates, Dr. McMahon found the limited empirical studies performed "have overwhelmingly shown that Asian clams either have no impact or a positive impact on macroinvertebrate communities."[358] After analyzing these studies, Dr. McMahon concluded as follows:

> Thus, the available empirical studies all show that Asian clams either increase or do not impact benthic macroinvertebrate density, species richness or diversity. They increase habitat heterogeneity by deposition of hard shell substrata to soft sand/silt sediments, reworking sediments or transfering energy attained through their filter feeding on pelagic phytoplankton and bacterioplankton into benthic sediments with their feces and pseudofeces providing additional food resources to benthic macroinvertebrates. In contrast, my extensive literature search revealed no studies that showed the presence of Asian clams significantly negatively

[357] McMahon Review at 4-5.

[358] *Id.* at 6.

impacted benthic macroinvertebrate community species abundance, richness, or diversity.[359]

Accordingly, concerns and caveats regarding speculation and the need for further research on Asian clam impacts are well founded. A thorough review of the published literature and unpublished reports (where available) revealed no studies that provided a substantive or scientifically valid causative link for a negative impact of Asian clam presence on native bivalve abundance and diversity.[360] At best, studies were only suggestive of the causative links between Asian clams and any observed declines in native bivalves. As one scientist correctly recognized:

> [E]vidence for impacts of Asian clams on native bivalves is derived largely from examining non-overlapping, spatial distributions of bivalves or, less frequently, from changes in populations of native bivalves over time. Most of this evidence is anecdotal and not quantifiable with little or no experimental evidence, thus making it impossible to be precise about the impacts Asian clams may have on native bivalves.[361]

Negative correlations between Asian clams and native bivalves may be explained by the spatial scale at which the relationship is examined. A study by Vaughn and Spooner (2006)[362]

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[359] *Id.* at 7-8.

[360] AST Report at 38; McMahon Review at 4-5.

[361] AST Report at 38 (citation omitted). Dr. Richardson further provides:

> More specifically to the point identified above, studies simply link or correlate declines in native bivalves; unionids and, more commonly, fingernail clams (Sphaeriidae); with the arrival of Asian clams in that area (Crumb 1977; Gardner *et al.* 1976). Further, numerous studies (*e.g.*, Belanger *et al.* 1990; Clarke 1986, 1988; Kraemer 1979; Sickel 1973) have reported that Asian clams and native bivalves, especially unionids, have non-overlapping spatial distributions, so that unionids are abundant only where Asian clams are rare, and *vice versa*. However, most of these studies were conducted during a time of unprecedented decline in native bivalves across North America independent of Asian clams. It is likely that any such noted correlation would have been confounded with other more notable factors like habitat destruction, overutilization for commercial or other purposes, disease, predation, introduction of non-indigenous species other than Asian clams, pollution, hybridization, and restricted ranges (Williams *et al.* 1993). Any or all of these factors may have contributed to observed declines in native bivalves while allowing the spread of Asian clams (Strayer 1999).

Id. at 38-39.

[362] *Id.* at 39 (citing C.C. Vaughn & D.E. Spooner, *Scale-Dependent Associations between Native Freshwater Mussels and Invasive Corbicula,* HYDROBIOLOGIA 568(1), 331-339 (2006)).

that considered different spatial scales concluded that Asian clam densities varied widely in areas without native mussels or where native mussels were in low abundance, but Asian clam density was never high in areas where native mussels were dense.[363] As explained by Dr. Richardson, Vaughn and Spooner pooled patch-scale density and biomass information to represent entire stream reaches.[364] In doing so, the negative relationship between native mussels and Asian clams disappeared and there was no significant relationship between native mussels and Asian clams.[365] Rather than Asian clams impacting native bivalves, the Vaughn and Spooner study suggests native bivalves may impede Asian clam establishment.[366] Thus, the study hypothesized that the likelihood of successful Asian clam invasion may decrease with increasing abundance of native mussels.[367] As explained in the AST Report:

> Vaughn and Spooner (2006) suggested lack of space for Asian clams to colonize, physical displacement by actively burrowing native mussels, and locally reduced food resources in patches where native mussels feed as possible explanations for the likely impediment. Taken altogether, the results from Vaughn and Spooner (2006) suggest that the often observed negative correlations between native bivalves and Asian clams may exist simply because Asian clams do not successfully colonize where native bivalves are abundant.
>
> Similarly, Asian clams may only preferentially invade sites where native unionids have already been decimated (Kraemer 1979; McMahon 2001; Strayer 1999) or these nonnative clams take advantage of underutilized benthic habitat not preferred or utilized by native bivalves (Diaz 1994; McMahon, *pers. com.*, Professor Emeritus, University of Texas-Arlington). Nonetheless, competition between native bivalves and Asian clams is still often, and perhaps erroneously, cited as contributing to the observed

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[363] *Id.*

[364] *Id.*

[365] *Id.*

[366] *Id.*

[367] *Id.*

negative relationship between Asian clams and native unionid bivalves.[368]

Very few studies have actually examined competitive interactions between Asian clams and native mussels.[369] In one study that examined this competitive interaction, Belanger *et al.* (1990) concluded that Asian clam densities had no significant effect on growth or density of *Elliptio* sp, a native unionid.[370] Likewise, Karatayev *et al.* (2003) reported that native unionids and Asian clams were both abundant and observed to occupy the same areas with completely overlapping distributions.[371] Asian clams and native unionids have been observed to occur together in relatively high abundances.[372] Morgan *et al.* (2004) state that, "*Corbicula* has established a permanent population in the Connecticut River with little impact on native bivalves."[373] In fact, in northern, cold water populations like the Connecticut River, Asian clam abundances reached > 3,000 clams/m^2 over a nine year period.[374] Also, a study conducted in the Czech Republic—a colder, more northern location—concluded "there was no visible negative impact to original molluscan communities," although abundances of the Asian clams were comparatively low.[375] As explained by Dr. Richardson, "if Asian clams are detrimental to native bivalves, examples of overlapping distributions, especially when accompanied by relatively high abundances of both clams and native bivalves, should be rare when, in fact, they are common."[376]

[368] *Id.* at 39-40.

[369] *Id.* at 40.

[370] *Id.*

[371] *Id.*

[372] *Id.*

[373] Morgan (2004) at 419.

[374] AST Report at 40.

[375] *Id.*

[376] *Id.*

Notably, the Morgan (2004) authors not only questioned the significance of thermal influence on Asian clam survival, they also went onto state that "[w]hile [the Asian clam] quickly established itself as the dominant bivalve in the Connecticut River, there was little change in native bivalve abundance found in the same sediments."[377] Further, "these [Asian] clams took advantage of underutilized benthic resources."[378] Morgan (2004) concluded that, "[t]he lack of correlation between presence of [Asian clam] and abundance of native clams and mussels suggest no detrimental effect of [Asian clam] on native species in the Connecticut River."[379] Morgan (2004) concludes that Asian clams were not harming the native bivalve fauna and certainly were not causing appreciable harm to the native mussels.[380]

EPA's Statement also refers to NHDES' Final 2014 Surface Water Quality Assessment (AR-1409) listing "non-native fish, shellfish or zooplankton" as a parameter that rated a "3-PNS," or "insufficient data/potentially not attaining standard," for the section of Hooksett Pool downstream from Merrimack Station (referencing NHIMP700060802-02).[381] EPA notes the same rating was applied to the Hooksett Pool bypass, just below the Hooksett Dam and in the Amoskeag Pool of the Merrimack River.[382] By comparison, EPA notes there is no such listing for the section of the Merrimack River immediately upstream of the Merrimack Station discharge canal or for the section upstream of Merrimack Station in the southern end of Garvins Pool.[383]

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[377] Morgan (2004) at 436.

[378] *Id.*

[379] *Id.*

[380] *Id.*

[381] AR-1534 at 42.

[382] *Id.* (citing AR-1409).

[383] *Id.* (citing AR-1409).

EPA's Statement omits NHDES' assessment from the water quality report card for the section of Hooksett Pool downstream from the Station (NHIMP700060802-02). As described below, NHDES explained its assessment as follows:

> The Asian clam, native to the freshwater of Southern and Eastern Asia, was documented at multiple locations within [the] Merrimack River from the Bow Power Plant to the Massachusetts border in 2011. While clams can form dense clusters of over 5,000 clams per square meter, dominating the benthic community and altering the benthic substrate[,] that has not yet been demonstrated here and have therefore been assessed as a potential problem.[384]

Notably, NHDES also recognized the ability of Asian clams to overwinter, surviving temperatures below 1°C for months at Lake George in New York.[385] Furthermore, in 2016, NHDES noted, "[n]o control actions implemented, densities remain the same."[386]

Obviously, NHDES does not believe that Asian clams are currently causing appreciable harm to the BIP either through densities or through domination and only considers the Asian clam as a potential problem. As such, NHDES' assessment is comparable to EPA's assessment in its Fact Sheet granting Mount Tom's variance requests—that the potential of the Asian clams to affect other species is currently unknown. As discussed below, however, there is ample support that the Asian clams are not causing appreciable harm to Hooksett Pool's BIP based on the data collected since EPA and NHDES' initial sampling effort.

Thus, "the evidence for Asian clam impacts on BIPs in general, and native bivalves in particular, is, at best, weak and largely correlative."[387] There are "very few studies addressing the

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[384] Assessment from the 2014 Water Quality Report Card for NHIMP700060802-02, NHDES. This document was located through a search at the following interactive website http://nhdes.maps.arcgis.com/apps/webappviewer/index.html?id=aca7a13dced5426aa542c62b1ea10d0c by entering "Merrimack River-Hooksett Hydro Pond" as the location, clicking on the Merrimack River image, and referencing the "Waterbody Data (Aquatic Life and Swimming Uses)" pop-up hyperlink. The "Sum_Final_Table" tab of this document, attached hereto as Exhibit 15, includes NHDES' comments concerning the "3-PNS" designation.

[385] *See* AR-1408 at 1.

[386] Assessment from the 2016 Water Quality Report Card for NHIMP700060802-02, NHDES. *See* Exhibit 15.

actual cause and effect of Asian clam establishment on the invaded ecosystem; furthermore, none support or report appreciable damage to the BIP," according to Dr. Richardson.[388] For that reason, an analysis of these very issues with respect to Hooksett Pool is particularly compelling—and such an analysis is described and recounted below.

3. Analysis of the Effect, If Any, of the Asian Clam on Native Bivalves and the Hooksett Pool BIP Demonstrates the Lack of Prior Appreciable Harm

Putting aside the question whether Merrimack Station's thermal discharges are contributing to the Asian clam's presence or numbers in Hooksett Pool, the pertinent question for purposes of EPA's § 316(a) "appreciable harm" analysis is whether the Asian clam is causing harm to the native species in Hooksett Pool (*i.e.*, the BIP). As recognized previously in these comments, § 316(a) authorizes EPA to grant variances for thermal discharges from "any point source otherwise subject to the provisions of section [301] . . . of [CWA]."[389] Specifically, § 316(a) permits EPA to grant a variance for thermal discharges whenever:

> [T]he owner or operator . . . can demonstrate . . . that any effluent limitation proposed for the control of the thermal component of any discharge from such source will require effluent limitations more stringent than necessary to <u>assure the protection and propagation of a [BIP]</u> of shellfish, fish, and wildlife in and on the body of water into which the discharge is to be made . . . .[390]

Although BIP is not defined by statute or regulation, the regulations state that "balanced, indigenous community" is synonymous with BIP.[391] Balanced, indigenous community is defined as:

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[387] AST Report at 41.

[388] *Id.*

[389] 33 U.S.C. § 1326(a).

[390] *Id.* (emphasis added).

[391] *See* 40 C.F.R. § 125.71(c).

> [A] biotic community typically characterized by diversity, the capacity to sustain itself through cyclic seasonal changes, presence of necessary food chain species and by a lack of domination by pollution tolerant species. Such a community may include historically non-native species introduced in connection with a program of wildlife management and species whose presence or abundance results from substantial, irreversible environmental modifications. Normally, however, such a community . . . may not include species whose presence or abundance is attributable to alternative effluent limitations imposed pursuant to section 316(a).[392]

For purposes of EPA's BIP analysis, the Asian clam, as a non-native species introduced to Hooksett Pool later in time should not be included in the analysis of Hooksett Pool's indigenous community, except to consider how its presence may have affected the BIP.[393] In other words, even assuming Merrimack Station's thermal influence is contributing to the presence or numbers of the Asian clam, the issue for purposes of PSNH's variance request is whether the Asian clam has caused appreciable harm to the balanced indigenous community.

To demonstrate that alternative limits "will assure the protection and propagation of a [BIP]," existing sources typically show there is an "absence of prior appreciable harm" to the BIP.[394] EPA guidance directs parties to study impacts to various plant and animal species, including: habitat formers, phytoplankton, zooplankton, macro invertebrates and shellfish, fish, and other vertebrate wildlife.[395] "[I]n attempting to judge whether the effects of a particular thermal discharge are causing the system to become imbalanced, it is necessary to focus on the

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[392] *Id.*

[393] AR-618 at 47 ("These species, and others that appeared later, should not have been included in an analysis of the balanced, indigenous community, except to explain how their presence may have affected the indigenous community."); *id.* at 52 ("Data provided in the Fisheries Analysis Report for the 2000s included (warmer water-favoring) species not present in Hooksett Pool in the 1960s and, therefore, not considered part of the balanced, indigenous community.").

[394] 40 C.F.R. § 125.73(a), (c)(1).

[395] *See generally* AR-444.

magnitude of the changes <u>in the community as a whole and in individual species</u>; *i.e.*, whether the changes are 'appreciable.'"[396]

Here, a study of the community as a whole leads to only one conclusion—the Asian clam has not caused prior appreciable harm to the BIP of Hooksett Pool and may, in fact, be benefitting it. If anything, its presence has diminished in comparison to other species since Normandeau's macroinvertebrate analysis in 2011. Multiple EPA approved analyses applied to data concerning Asian clams and native bivalve populations in Hooksett Pool—collected by scientists held in high regard in their areas of expertise—demonstrate the Asian clam is simply co-existing with, and not displacing, native bivalves. The only evidence concerning the Asian clam in Hooksett Pool that is based on sound science and established scientific collection methods proves the Merrimack Station thermal discharge is not causing *any* harm, much less appreciable harm, to the BIP of Hooksett Pool.

a. The 2011 Normandeau benthic macroinvertebrate survey does not support an implication of appreciable harm.

In the Statement, EPA remarked on the "notabl[e] concentrat[ion]" of Asian clams "in areas of Hooksett Pool with water temperatures directly affected by the plant's thermal discharge," noting Normandeau's survey conducted in 2011 (published in 2012) had revealed survey sites in Hooksett Pool where Asian clams were numerically dominant *vis a vis* native benthic macroinvertebrates.[397] In considering that information, EPA noted:

> Of the 18 samples taken at or downstream of the plant's discharge . . . Asian clams were the dominant taxon in 14 of them, ranging in relative abundance from 58 to 94 percent, with a mean of 78.6 percent at the sites where they were dominant. EPA found this discovery worthy of further research because of the possibility that Merrimack Station's thermal discharge was contributing to the

[396] *Wabash*, 1 E.A.D. at *7 (emphasis added).

[397] AR-1534 at 41.

> presence and/or prevalence of the Asian clam in the Hooksett Pool and the potential relevance of such a finding to regulating [Merrimack Station's] thermal discharges . . . .[398]

As noted in the preceding subsection, EPA believes the "potential relevance" of such a finding is that "CWA § 316(a) variance-based temperature limits must assure the protection and propagation of the [BIP] of organisms" in Hooksett Pool.[399] EPA implies the Asian clam numbers from Normandeau's survey suggest continuation of PSNH's thermal variance from the 316(a) requirements may not assure the protection and propagation of the BIP in Hooksett Pool,[400] apparently notwithstanding that (1) Normandeau found no appreciable harm to the Hooksett Pool BIP based on its 2011 benthic macroinvertebrate analysis, (2) there is no evidence suggesting the Asian clam is displacing or impacting native species, and (3) Asian clam populations, as a rule, may fluctuate greatly from year-to-year before reaching an equilibrium.

In 2011, when Asian clams were first identified and sampled by Normandeau, their densities totaled around 1,100 clams/m^2 at Merrimack River Station S0, near 2,400/m^2 at S4, and just under 1,900/m^2 at S17.[401] Such numbers are not surprising considering Asian clam populations grow rapidly due, in part, to the clam's high allocation of energy to growth and reproduction that is typical of invasive species.[402] "This high allocation of energy to growth and reproduction is responsible for the relatively high fecundity (25,000-75,000 per lifetime of a hermaphroditic individual []) and, due to relatively low physiological tolerances, [Asian] clams depend on this elevated fecundity for invasive success and rapid population recovery."[403]

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[398] *Id.*

[399] *Id.*

[400] *See id.* at 41-43.

[401] AST Report at 22.

[402] *Id.*

[403] *Id.* (citing McMahon 2002).

Within two years of the 2011 sampling, however, *C. fluminea* densities fell dramatically to less than 250, 113, and 54 clams/m^2 at S0, S4, and S17, respectively.[404] As recounted in the AST Report, such large fluctuations in population density are typical with Asian clams: "Asian clam populations may rapidly reach high abundances, but a low juvenile survivorship and a high mortality rate throughout adult life leads to considerable annual, seasonal, and site-to-site variability and fluctuations in abundances and frequent population mortality events."[405]

Following the 2013 population decline at Hooksett Pool, Asian clam densities rebounded to over 5,000/m^2 at S4, 4,100/m^2 at S17, and back to around 1,000/m^2 at S0 in 2014 only to precipitously crash again in 2016.[406] Eventually, Asian clam population abundances at Merrimack Station are expected to reach a quasi-equilibrium, as is typical with other Asian clam populations, with annual abundances commonly fluctuating as much as 2-3 orders of magnitude.[407]

These dramatic population fluctuations highlight the importance for multi-year surveys and assessments of clam populations in order to correctly ascertain numerical dominance and appreciable harm to the BIP. Dr. Richardson explains:

> For example, of the nine sites sampled in 2011 that had Asian clams, Normandeau (2012) assessed seven of those sites as having Asian clam percent composition >50%, *i.e.*, [Asian] clams were the numerically dominant benthic invertebrate (Table 3). Conversely, due to dramatic invertebrate population fluctuations and inherent variability in Asian clam population densities, by 2014 the percent composition of Asian clam had declined in seven of the nine sample locations and in six of the nine locations Asian clams were no longer numerically dominant (*i.e.*, <50%). By 2016, Asian clams were no longer numerically dominant at <u>any</u> of the

[404] *Id.* at 23.

[405] *Id.* (citations omitted).

[406] *See id.*

[407] *Id.*

> nine sites including the sites directly within the cooling water plume.
>
> Clearly, therefore, whether or not the Asian clam is the numerically dominant benthic invertebrate of the BIP in Hooksett Pool depends entirely upon which year's data are examined. These data clearly point out that numerical dominance of the BIP by a nonindigenous species with a life history such as that of the Asian clam <u>cannot</u> be assessed based on 2011 data alone.[408]

And if such dominance cannot be accurately assessed, then one certainly should not use such population figures to assert the Asian clam is causing appreciable harm to Hooksett Pool's BIP.

Ironically, however, a thorough analysis of the results of Normandeau's 2011 survey (articulated in its 2012 report) provides insight as to the relationship of the Asian clam with Hooksett Pool's BIP.[409] While greater numbers of Asian clams existed at certain locations in Hooksett Pool compared to others, Normandeau concluded that mean taxa richness, mean EPT richness, and mean EPT/Chironomidae abundance ratio all increased in Hooksett Pool from 1973 to 2011. These EPA recommended indicators of BIP health all increased with the addition of the Asian clam.[410]

Further, the numerically dominant taxon collected during Normandeau's bankside kick sampling was a species that prefers unpolluted, clear cold waters (the freshwater arthropod *Gammarus fasciatus*) and, for that matter, "'kick sample data collected from the aquatic insect community . . . showed dramatic improvements in the aquatic insect community composition between 1972 and 2011.'"[411]

In conclusion, therefore, the Normandeau report, as based on the 2011 survey work, does not establish a scientific basis for concluding the Asian clam is the numerically dominant taxon

[408] *Id.* at 23-24 (emphasis added and in original, respectively).

[409] *See* AR-1174.

[410] AST Report at 24-25.

[411] *Id.* at 25 (quoting AR-1174).

in Hooksett Pool. In fact, if one did want to draw conclusions from the Normandeau report (for that particular time period), the more relevant conclusion would be that, despite the presence of large numbers of Asian clams at certain survey sites in Hooksett Pool, overall BIP health in Hooksett Pool is trending in a positive, rather than an adversely impacted, direction.

b. EPA's and NHDES' 2013 and 2014 Asian clam studies fail to demonstrate appreciable harm to Hooksett Pool's BIP or New Hampshire Water Quality.

EPA, in coordination with NHDES, conducted limited study and investigation of the Asian clam in certain New Hampshire waters in 2013 and 2014.[412] In the Statement, EPA observes, "[t]his qualitative sampling revealed both higher densities of clams and larger individuals near the mouth of the discharge canal, as compared to clams collected farther downstream in Hooksett Pool, and in Amoskeag Pool below the Hooksett Dam" and that "[n]either benthic sampling conducted by NHDES during 2013 (AR-1414), nor EPA dive investigations in 2014 (AR-1412), found evidence of Asian clams upstream from [Merrimack Station] in Hooksett Pool or Garvins Falls Pool."[413] Following these statements, EPA leaps to the (uncited and unsubstantiated) conclusion in the Statement that "[t]he arrival of invasive Asian clams in NH represents a threat to the state's water quality."[414]

As acknowledged by EPA, when required by the FOIA to do so, EPA provided PSNH with data derived from the 2013 and 2014 studies. As discussed below, EPA's and NHDES' collection and analysis of the relevant Asian clam data did not follow established scientific

[412] AR-1534 at 42.

[413] *Id.*

[414] *Id.*

processes and, for that matter, suffered from other significant deficiencies (such as a failure to fully appreciate the expanding range of the Asian clam in the northern United States).[415]

First, EPA's 2013 study of Asian clams in New Hampshire, conducted in coordination with NHDES, erroneously reported the abundance of Asian clam at three New Hampshire sites. More than one-third of the samples collected in the Merrimack River during the study that did not contain any Asian clams were inappropriately excluded from density calculations and other analyses, skewing the entirety of the data.[416] Specifically, the elimination of this data incorrectly inflated densities to almost twice what they should have been based on actual EPA field data sheets.[417] Compounding the error, EPA took this faulty density data from the Merrimack River and compared it to Asian clam abundances in the nearby Cobbetts and Long Ponds. This led to the erroneous conclusion that clam abundances in the Merrimack River were greater than those found in the two other ponds, when, in actuality, a correct analysis reveals the Asian clam's presence in the Merrimack River is not significantly different than found elsewhere.[418]

EPA's second error in this 2013 study in the Merrimack River stems from its inclusion of samples containing only native unionid bivalves that were counted as Asian clams.[419] This too led to an improper inflation in the estimates of Asian clams within the waterbody.[420] Furthermore, EPA broke from accepted scientific protocol by utilizing replicate means instead of

[415] *See* AST Report at 26-33.

[416] *Id.* at 26.

[417] *Id.*

[418] *See id.* at 26-29.

[419] *Id.* at 27.

[420] *Id.*

means calculated directly using sample replicates to generate and report its means for the study[421]—calling into question the agency's conclusions.

In contrast, when the analysis is performed correctly, the EPA data from the 2013 study supports the conclusion that the Asian clam's presence in the Merrimack River is not significantly different than found elsewhere and, in fact, demonstrates that the Asian clam's presence in these waters is part of the clam's naturally occurring, worldwide northern range extension often taking place in the absence of thermal discharges.[422]

EPA's 2014 study of Asian clams is similarly faulty. As explained in the AST report,

> A review of the sampling design that EPA utilized in 2014 indicates that it also was not based on acceptable scientific practices. As a result, the inappropriate sample design led to inaccurate and inappropriate conclusions about the significance of the Asian clam and native bivalve species. Specifically, EPA's 2014 study employed an inappropriate sample design for the Asian clam in Hooksett Pool. EPA excavated Asian clam samples and conducted video observations along a single transect at station S0. The sample design located the survey transect parallel to the shore and within and along a known, high-density Asian clam area. This approach was contrary to well-established scientific protocol for river sampling of bivalves that dictates that (1) multiple transects be used, (2) transects be located perpendicular to the shoreline, and (3) transects span the width of the river when possible. Utilizing its flawed sampling design, all EPA-excavated samples and video were taken from areas known to have high clam concentrations. Where EPA did employ multiple transects for ponar samples in 2014, the samples were limited to the west and middle of the transects, all locations of known high clam abundance and were not indicative of conditions in Hooksett Pool. Such an approach adversely affected the accuracy of any impact or assessment of Asian clam[s] on the [BIP] in Hooksett Pool.[423]

Both studies suffer from one additional flaw: neither attempted to gather data on the resident benthic invertebrate community of Hooksett Pool, meaning they fail to provide any basis

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[421] *Id.*

[422] *Id.* at 27-28.

[423] *Id.* at 28.

for analysis on whether the Asian clam is causing appreciable harm to the BIP.[424] Based on AST's review, there was no data or information produced through PSNH's FOIA and New Hampshire Right-to-Know requests that attempted to assess the benthic invertebrate community Hooksett Pool beyond clams.[425]

The result of these errors is that EPA's 2013 and 2014 sampling artificially inflated the abundance and significance of Asian clams in Hooksett Pool. The data derived from these efforts is, therefore, invalid for assessing the abundance of clams in the Merrimack River or their impact (or lack of impact) to the BIP.[426] Further compounding these data collection issues, EPA's analysis of the results of the 2013 and 2014 surveys also omitted relevant range extension data and could lead to erroneous connections between the Asian clam and Merrimack Station.[427] Specifically,

> [O]f the 11 documented locations of Asian clam in New Hampshire (USGS 2017), only one, Hooksett Pool, Merrimack River, receives cooling water discharge. . . . EPA developed data on clam presence at several sites in New Hampshire. EPA's data, however, show no significant differences (ANOVA, P = 0.687) among sites in Asian clam numbers with and without thermal discharge (Figure 1). Unlike other EPA data sets and analyses, these data were collected using multiple sample replicates and, in the case of the Merrimack River, using shore-to-shore transects as is standard protocol; there is no indication that EPA's information using this sampling protocol is incorrect. Asian clam densities among all four New Hampshire sites surveyed by NHDES for EPA were similar when comparing two sites with no thermal effluent, Cobbetts Pond and Long Pond; and two sites receiving Merrimack

[424] *Id.* at 29.

[425] *Id.* Dr. Richardson noted that there was some limited information in these agency materials regarding sampling for native mussels. *Id.* However, the sampling design provided was inappropriate for native unionid mussels and could only suffice for an analysis of native fingernail clams, which was not apparent within the four-corners of the materials. *Id.* The agency materials were clearly aimed at sampling Asian clams only, according to Dr. Richardson, and therefore do not allow for an assessment of appreciable harm—if any—to the BIP of Hooksett Pool. *Id.*

[426] *Id.*

[427] *Id.* at 30.

> Station cooling water, Hooksett Pool and Amoskeag Pool (Figure 1). The pattern suggests Asian clam densities may even be lower at Hooksett Pool receiving cooling water discharge from Merrimack Station compared to the two sites lacking any thermal input, *i.e.*, Cobbetts and Long ponds. Such a discernable pattern warrants recognition; however, such analysis was not provided.[428]

For that matter, EPA also omitted information on Asian clams from (1) Wash Pond, (2) the upper Merrimack River north of Concord, and (3) below Amoskeag Dam at the Pennichuck Water Works pipeline in the Merrimack River, all sites that also do not receive cooling water discharge.[429]

Although perhaps admittedly beyond the scope of EPA's and NHDES' immediate studies, had they conducted a broader geographic review of the Asian clam's range in the northern United States, they would have likely discerned the species' spread into bodies of water lacking thermal input is well-documented and "strongly supports the position that thermal discharge is not a requirement for spread and establishment of the Asian clam."[430] For example:

- There are at least 25 documented locations of established Asian clams at locations as far north, or nearly so, as is Hooksett Pool of the Merrimack River (Table 6).
- Twelve of these documented locations are in the New England area of the U.S.
- Eleven of these documented locations are in New Hampshire and one in Maine.
- Four of these New England locations are as far or farther north than Hooksett Pool of the Merrimack River.[431]

In light of the foregoing issues with data collection and analysis, EPA's and NHDES' work in 2013 and 2014 does little more than illustrate the Asian clam's presence in Hooksett Pool and certainly does not support the Asian clam in Hooksett Pool as "a threat" to the Pool's

[428] *Id.*

[429] *Id.*

[430] *Id.*

[431] *Id.* at 31.

water quality.[432] AST's more comprehensive analysis of the issue, as detailed below, leads to a far different conclusion.

c. AST's comprehensive investigation and analysis of Asian clams and native species in Hooksett Pool demonstrates an absence of prior appreciable harm to the BIP.

AST, in coordination with Normandeau, performed extensive investigation into the presence of the Asian clam and its relationship to the Hooksett Pool BIP, specifically the native benthic macroinvertebrates. The investigation included a two-year study of the Asian clam in Hooksett Pool to assess how, if at all, it has been impacted by Merrimack Station's thermal discharges and whether it is causing appreciable harm to the BIP of Hooksett Pool. Multiple dives were conducted excavating 0.25 m^2 samples and performing semi-quantitative assessments, and numerous ponar grab samples were taken along multiple transects in November/December 2014 and again in July 2016, leading to the collection of numerous clam and macroinvertebrate samples.[433] The samples were analyzed following scientifically accepted methods and led to the following overall conclusion by Dr. Richardson: "[T]he indigenous ecology of Hooksett Pool, supported by an apparently viable and self-sustaining food chain, is typical of what one would expect to find in a New Hampshire river system – and . . . represents a marked improvement over the river's pollution-impacted state in the first half of the 20th century."[434]

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[432] *See* AR-1534 at 42. In follow-up to its limited investigation in 2013 and 2014, EPA developed a plan to study the presence and abundance of the Asian clam in the Merrimack River in order to improve the agency's "understanding of the power plant's influence" on the Asian clam and, in turn, "to further evaluate the plant's ability to meet state and federal water quality standards, and its NPDES requirements, as they apply to protecting the resident biological communities." Project Plan at 3. EPA's planned 2015 study, however, was not undertaken. *See* AST Report at 3, 33.

[433] *See* AST Report at 34.

[434] *Id.* at 35.

In addition to assessing the health and viability of Hooksett Pool's indigenous ecology, Dr. Richardson analyzed whether or not the indigenous populations or communities found in Hooksett Pool's ecology are threatened by harmful imbalance caused by the Asian clam's introduction to the water body. In order to derive actual data on the Asian clam in Hooksett Pool on which scientific conclusions regarding the clam and its ecological impact could be based, Dr. Richardson compared "abundances and size-frequency distributions of native bivalves at designated river sampling sites with Asian clams and those without clams . . . to see if Asian clams were in any way causing appreciable harm to the native mussel community."[435] Using SCUBA, dive assessments were performed in 2014 and 2016 that followed scientifically approved collection methods.[436] These studies revealed that native bivalve abundance was unaffected by the presence of Asian clams and an absence of appreciable harm. As explained in the AST Report:

> Analysis of the diver excavated 0.25 m^2 quadrates indicated a significant difference among native bivalve species (2-way ANOVA; P = 0.014), but did not reveal a significant difference among stations (P = 0.227), and there was no significant station by species interaction (P = 0.251) (Figure 3). ***No significant station by species interaction means that native bivalve abundance was unaffected by presence of Asian clams and certainly no appreciable harm was indicated.*** Notably, native bivalves, mostly *Elliptio complanata* and sphaeriids, had densities at Station N10, where no clams occurred, similar to those of Station S24, where clams were fairly abundant (Figure 3).
>
> Examining the results of semi-quantitative diver transect surveys (Appendix C1 and C2) indicated that Asian clams were located at survey sites S0, S4, S17, and S24. Numerous native mussels were also located at those same survey sites (and elsewhere in Hooksett Pool). From these assessments, it is clear that ***native bivalves were as abundant and spatially distributed, i.e., near the shore, along transects without Asian clams ([Upstream Reference Site]***

435 *Id.* at 41.

436 *Id.*

> ***through N5) as they were along transects with Asian clams*** (S0-S24). Also, the native bivalves appear to avoid the mid-channel area of the river. As suggested by Vaughn and Spooner (2006), it is highly likely that Asian clams in Hooksett Pool are mostly exploiting the highly disturbed mid-channel shifty and loose sand substrate generally uninhabited by native bivalves. These areas are largely unsuitable and inappropriate for most native bivalve species, especially members of the Unionidae, but provide typical habitat for Asian clams (McMahon 2002 and *pers. comm.*).[437]

Recognizing this reality is important, because "ignorance of the spatial distribution of native bivalves and Asian clams . . . would lead one to a spurious negative correlation between native bivalve abundance and Asian clam density [and,] subsequently[,] to an incorrect conclusion of a negative impact of Asian clams on native bivalves . . . which is simply not the case."[438]

Furthermore, if Asian clams were causing appreciable harm to the native bivalves through competition, there would be differences in population size structure between stations with Asian clams versus those without Asian clams.[439] Specifically, if negative competitive interactions between native bivalves and Asian clams were occurring (with the subsequent appreciable harm), one would expect to see smaller native bivalves in those locations where Asian clams are present (as compared to those locations where they are absent).[440] But in Hooksett Pool, a comparison of the size-frequency distribution of native bivalves from stations with Asian clams to stations without Asian clams did not reveal significant differences.[441] This is indicative of no appreciable harm.[442] Further, if Asian clams were causing appreciable harm to native bivalve recruitment by impacting glochidia and settling juveniles, one would expect to

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[437] *Id.* at 41-42 (emphasis in bold and italics added).

[438] *Id.* at 42.

[439] *Id.*

[440] *Id.*

[441] *Id.* at 43.

[442] *Id.*

see a corresponding lack of smaller individuals at stations with Asian clams compared to stations without Asian clams.[443] Again, however, no difference was detected between the two distributions. These findings show that Asian clams are not causing appreciable harm to native bivalves through negative impacts on recruitment.[444]

Dr. Richardson not only compared and analyzed Asian clams to native bivalve populations in the course of his work, but also utilized various EPA-approved metrics to fully analyze appreciable harm, or lack thereof, to the Hooksett Pool BIP. Such analysis further demonstrated the Asian clam is not causing appreciable harm to the BIP of Hooksett Pool, according to Dr. Richardson.[445] A summary of the key analyses that led to Dr. Richardson's ultimate conclusion are summarized below.

First, although Normandeau's 2012 study shows Asian clams were abundant in 2011, when this 2011 data is compared against data Normandeau collected in 1972 and 1973, taxa richness, EPT richness, and EPT to *Chironomidae* abundance ratio all increased in the Hooksett Pool despite the presence of the Asian clam.[446] This indicates an improvement in the BIP, not harm.[447] "If clam presence and abundance caused appreciable harm to the BIP, these metrics should have decreased from 1972 and 1973 compared to 2011 rather than increased," as they did.[448]

Second, the abundance of all other benthic invertebrates in the Hooksett Pool was the same or higher at sampling stations at which Asian clams were also present compared to

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[443] *Id.*

[444] *Id.*

[445] *Id.*

[446] AR-1174 at 18.

[447] AST Report at 43.

[448] *Id.*

sampling stations that did not include any Asian clams.[449] "Interestingly, there were even higher invertebrate abundances at S17, one of the sites with the highest Asian clam densities. For Asian clam presence and abundance to have caused appreciable harm to the benthic macroinvertebrate BIP, the abundance of other benthic invertebrates should have been reduced at stations without clams."[450] No such reductions were identified, according to Dr. Richardson.[451]

Third, BIP taxa richness—an assessment EPA has recognized is the best candidate benthic invertebrate community metric—was the same or higher among all sampling stations at which Asian clams were present compared to those at which they were not.[452] "For Asian clam presence and abundance to have caused appreciable harm, the taxa richness of other benthic invertebrates should have been significantly reduced at sites with clams."[453] There were, however, no such reductions.[454]

Fourth, the BIP Shannon Community Diversity Index, which focuses on quantifying the uncertainty in predicting the species identity of an individual that is taken at random from the dataset, was the same among many stations at which Asian clams were present compared to those at which they were not.[455] "For Asian clam presence and abundance to have caused appreciable harm, the Shannon Community Diversity of other benthic invertebrates should have

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[449] *Id.* As explained in the AST Report, there was no statistically significant difference ($P>0.05$) among these sites. *Id.*

[450] *Id.* at 43-44.

[451] *See id.* at 44. At S4 and S17, the two stations with the highest Asian clam abundance, the abundance of all other benthic invertebrates were generally the same in 2011, 2014 or 2016, compared to 1972 or 1973. "For Asian clam presence and abundance to have caused appreciable harm, the abundance of other benthic invertebrates should have been significantly reduced in 2011, 2014 and 2016." *Id.* There were no such reductions.

[452] *Id.*

[453] *Id.*

[454] *See id.* BIP taxa richness was the same at S4 and S17 (the two stations with highest Asian clam abundance) in 2011, 2014 or 2016, compared to 1972 or 1973. "For Asian clam presence and abundance to have caused appreciable harm, the taxa richness of other benthic invertebrates should have been reduced in 2011, 2014 and 2016." *Id.* at 45. No such reductions occurred.

[455] *Id.*

been significantly reduced at sites with clams."[456] As explained by Dr. Richardson, that was not the case.[457]

Fifth, Dr. Richardson assessed Hooksett Pool in terms of the Hilsenhoff Biotic Index ("HBI"), another EPA-approved benthic macroinvertebrate BIP metric.[458] A lower HBI means the benthic community is healthier and comprised of invertebrates that are less tolerant to pollution.[459] The HBI's were the same or lower among stations with versus those without Asian clams. In particular, the HBI's "<u>were the same or lower</u> at the two stations with highest Asian clam abundance (S4 and S17) in 2011, 2014 and 2016 following Asian clam establishment compared to 1972 or 1973, prior to Asian clam establishment."[460] The HBI of the Hooksett Pool benthic invertebrate community should have significantly increased at site with Asian clams if the species have caused appreciable harm to the BIP. No such increases occurred.[461]

Sixth, recognizing EPA considers EPT taxa richness another of the best metrics for assessing the health of benthic invertebrate communities, Dr. Richardson utilized it in his analysis and found the richness in the Hooksett Pool to be "<u>the same or higher</u> among stations

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[456] *Id.*

[457] *See id.* Dr. Richardson provides:

> BIP Shannon Community Diversity Indices <u>were the same</u> (ANOVA, P = 0.157) at the two stations with highest Asian clam abundance (S4 and S17) in 2011, 2014 and 2016 following Asian clam establishment compared to 1972 or 1973, prior to Asian clam establishment (Figure 10). For Asian clam presence and abundance to have caused appreciable harm, the Shannon Community Diversity of other benthic invertebrates should have been significantly reduced in 2011, 2014 and 2016.

Id. However, no such reductions were revealed through Dr. Richardson's analyses.

[458] *Id.* at 46. "The HBI estimates the overall pollution tolerance of the community in a sampled area, weighted by the relative abundance of each taxonomic group." *Id.*

[459] *Id.*

[460] *Id.*

[461] *See id.*

with *versus* those without Asian clams."[462] EPT "derives its name from its reliance on counting the presence of three benthic insect groups: *Ephemeroptera* (mayflies), *Plecoptera* (stoneflies), and *Trichoptera* (caddisflies)."[463] EPT taxa richness at S4 and S17 (again, the two sites with the highest abundance of Asian clams) was the same or higher in 2011, 2014 and 2016, compared to 1972 or 1973, prior to the time the clams became established in the waterbody.[464] "For Asian clam presence and abundance to have caused appreciable harm, the EPT taxa richness should have been significantly reduced at sites with clams."[465] But no such reduction was evident.[466]

Seventh, HBI, Shannon Diversity Index, taxa richness, and total invertebrate abundance (minus Asian clams) estimates per sample were each analyzed for correlation with Asian clam abundances using samples taken in 2011 and 2014.[467] As explained in the AST Report,

> There was no significant correlation between Asian clam abundance and HBI [], Shannon diversity [], taxa richness [], or total invertebrate abundance []. For Asian clam presence and abundance to have caused appreciable harm, the Shannon diversity index, taxa richness, and total invertebrate abundance (minus Asian clams) of benthic invertebrates would be expected to have significant negative correlations with Asian clam abundance; HBI would be expected to have a significant positive correlation.[468]

Those correlations, however, were not identified.[469]

Eighth, Dr. Richardson utilized the Bray-Curtis Community Similarity Index to assess the health of the benthic invertebrate community in the Hooksett Pool. The "cluster analysis

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[462] *Id.*

[463] *Id.* (emphasis added).

[464] *Id.* at 47.

[465] *Id.* at 46-47.

[466] *See id.*

[467] *Id.* at 47.

[468] *Id.*

[469] *See id.*

clustered stations into three groups, each containing stations with and without Asian clams."[470] This indicates the macroinvertebrate communities among the sampling stations with and without Asian clams were very similar.[471] "For Asian clam presence and abundance to have caused appreciable harm, the Bray-Curtis Community Similarity clusters of benthic invertebrates should have separated sites with clams from sites without clam. Such separation was not encountered," however.[472]

Finally, the MDS Community Ordination (utilizing analyses from the Bray-Curtis Similarity Index), "lumped stations into three groups, each containing stations with and those without Asian clams indicating similar macroinvertebrate BIPs among stations with and without Asian clams."[473] This too supports a finding that Asian clams are not causing appreciable harm to the Hooksett Pool BIP. For, if they were, the MDS Community Ordination would have "separated sites with clams from sites without clams. Such separation was not encountered," however.[474]

Dr. McMahon concurred with each of these conclusions by Dr. Richardson and further provided: "All of the above described results consistently suggest that benthic macroinvertebrate abundance and diversity in areas of Hooksett Pool with Asian clams have either remained unchanged or have significantly increased resulting in no change to or an increase in biotic integrity as measured by the [HBI]."[475]

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[470] *Id.* at 48.

[471] *See id.*

[472] *Id.*

[473] *Id.*

[474] *Id.*

[475] McMahon Review at 6 ("Thus, the data support AST Environmental's conclusions that Asian clams are not negatively impacting the BIP of the Hooksett Pool benthic macroinvertebrate community.").

In summary, over a dozen analytical exercises, relying on the application of EPA-approved metrics to data scientifically derived from Hooksett Pool, generated results that demonstrate the Asian clam is not causing harm to the BIP in Hooksett Pool. This undisputed evidence, coupled with the in-Pool evidence that the Asian clam is simply co-existing with, rather than replacing, native bivalves, demonstrates an absence of prior appreciable harm to the Hooksett Pool BIP.

d. Asian clams may even be positively impacting Hooksett Pool and its BIP.

"Despite the popular conclusions and suppositions to the contrary . . . Asian clams may actually have *positive*, rather than negative, effects on their ecosystems."[476] This is because all bivalves—even the Asian clam—are considered ecosystem engineers (*i.e.*, organisms that can physically modify the environment). This trait has been recognized as important in scientific journal articles.[477] As explained in the AST Report:

> Asian clam shells can be abundant, persistent, and ubiquitous, thereby improving the physical structure of the substratum of the aquatic habitat for other species. It is commonly accepted that Asian clam shells have positive effects through providing substrate for epibionts, refuge from predation, reducing physical or physiological stress, control transport of solutes and particles in the benthic environment, stabilization of sediment, and through bioturbation of sediments. For example, clam shells form a more stable, complex, sheltered, and heterogeneous habitat that is attractive for several species including other mollusks, algae, freshwater sponges, crustaceans, and insects.[478]

In fact, areas of the Tennessee River with silty sediments previously unsuitable for native bivalves have been transformed by Asian clams into suitable, more stable substrate increasing

[476] AST Report at 49.

[477] *Id.* (citing three scientific articles).

[478] *Id.* at 49-50 (citation omitted).

the presence of native unionid mussels, and other scientists have found that Asian clam shells provided valuable hard substrate for other benthic organisms.[479]

The presence of the Asian clam can be beneficial in other ways, as well:

> Asian clam movement within the top layer of sediments leads to bioturbation. Such bioturbation contributes to substantial changes in abiotic conditions like dissolved oxygen, redox potential, amount of organic matter, particle size, and the like, in a manner typically enhancing habitat conditions for other organisms. Furthermore, high filtration rates by Asian clams remove a wide range of suspended particles having important repercussions for water clarity and subsequent light penetration that apparently benefit submerged plants.[480]

In fact a team of researchers found "'[t]here was no evidence of a negative impact on the distribution of the native bivalve in spite of high measured rates of water clearance by *C. fluminea*'" in one of the few experimental studies examining Asian clam filter feeding effects on native bivalves.[481] Dr. Richardson concludes his analysis on this positive impact from the Asian clam as follows: "In general, consideration of studies on the ecosystem engineering of bivalves, including Asian clams, overwhelmingly suggest that they either have no effect on native benthic invertebrates, *i.e.*, the BIP, or they '. . . mainly have positive effects on the density of benthic invertebrates' and conclude that invasive bivalve species, in general, '. . . have positive effects on invertebrate density, biomass and species richness.'"[482]

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[479] *Id.* at 50 (citations omitted).

[480] *Id.* (citations omitted).

[481] *Id.* (quoting L.G. Leff, J.L. Burch, & J. McArthur, *Spatial, Distribution, Seston Removal, and Potential Competitive Interactions of the Bivalves Corbicula fluminea and Elliptio complanata, in a Coastal Plain Stream*, FRESHWATER BIOLOGY 24(2), 409-416 (1990)).

[482] *Id.* at 50-51 (quoting R. Sousa, J.L. Gutiérrez, & D.C. Aldridge, *Non-Indigenous Invasive Bivalves as Ecosystem Engineers*, BIOLOGICAL INVASIONS 11(10), 2367-2385 (2009)).

4. Conclusion

There is no evidence that the Asian clam's presence in Hooksett Pool is causing harm to the BIP or negatively impacting New Hampshire water quality. First, based on its analysis of the benthic macroinvertebrate community as set forth in its 2012 report, Normandeau confirmed the absence of prior appreciable harm to the Hooksett Pool BIP. Subsequent investigation by EPA and NHDES did not result in a different conclusion. In addition to the flaws in the EPA and NHDES sampling effort and analyses in 2013 and 2014, this very limited investigation did not consider the impact of the Asian clam on native species in Hooksett Pool. The analyses, when performed correctly, reveal the significant fluctuations in Asian clam population from year to year.

While a study to consider the impact of the Asian clam in Hooksett Pool was contemplated by EPA in 2015, the study ultimately was abandoned. AST, in coordination with Normandeau, performed an extensive investigation of the Asian clam in Hooksett Pool to determine the effect of the Asian clam on the BIP of Hooksett Pool. Based on an extensive two-year study following scientifically approved methods and utilizing various EPA approved metrics, Dr. Richardson found a healthy benthic macroinvertebrate community that showed no signs of any harmful impact of the Asian clam on native species or otherwise. This undisputed evidence, coupled with the in-Pool evidence that the Asian clam is simply co-existing with, rather than replacing, native bivalves, demonstrates an absence of prior appreciable harm to the Hooksett Pool BIP or New Hampshire's water quality. As such, there is no lawful or legitimate basis to establish thermal discharge limits for Merrimack Station and/or under New Hampshire water quality standards based on the presence of the Asian clam in Hooksett Pool. The findings of no appreciable harm to the BIP, coupled with substantial questions concerning whether CCC would materially impact the clam's presence in Hooksett Pool, should require no action with respect to CWA § 316(a) except possibly the continued monitoring of the clam's presence in Hooksett Pool.

III. The 2014 Final § 316(b) Rule Requires EPA to Revisit its BTA Determination in the Draft Permit

In 2011, EPA utilized its BPJ authority to render a determination that a limitation of the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in CCC mode annually from April 1 through August 31, is BTA pursuant to § 316(b). PSNH and other interested stakeholders disputed this determination as arbitrary and capricious in their February 2012 comments to the Draft Permit. These comments were validated by EPA's promulgation of the 2014 final § 316(b) rule, in which the agency specifically rejected CCC as BTA for the industry.[483]

EPA correctly acknowledges in its Statement that its BPJ-based BTA determination in the Draft Permit is now null and void due to the new final § 316(b) rule. The agency is required to generate a new BTA determination in accordance with the requirements of this new rulemaking. A reasonable application of this rule would lead to a conclusion that the operation and technologies of the existing CWISs constitute BTA because the rates of impingement and entrainment at the facility are *de minimis* and because EPA implicitly acknowledged in its final § 316(b) rule that facilities with a three-year average AIF below 125 MGD are not required to address entrainment, absent extenuating circumstances (which do not exist at Merrimack Station).

Set out below is a detailed discussion of the final § 316(b) rule, including a well-reasoned application of its requirements to Merrimack Station—dictating that existing CWISs constitute BTA. PSNH also sets out a discussion of the 2017 evaluation of wedgewire screen technologies

[483] *See, e.g.*, 79 Fed. Reg. at 48,340.

by Enercon and Normandeau, as well as an analysis of whether this CWIS technology is feasible and cost-effective for the facility. PSNH concludes its § 316(b) discussions by revisiting and updating it 2012 comments to the Draft Permit regarding why CCC is not and cannot be BTA for the CWISs at Merrimack Station.

A. Legal Background

PSNH set out the complete CWA § 316(b) legal history in its February 28, 2012 comments to EPA's original Draft Permit.[484] Included here is the only relevant legal background: an explanation of EPA's 2014 § 316(b) final rule, which governs the regulation of all CWISs within the industry—including the CWISs at Merrimack Station.

EPA published its CWA final § 316(b) rule for CWISs on August 15, 2014.[485] The final rule became effective October 14, 2014.[486] It applies to existing industrial facilities with the capability to withdraw greater than 2 MGD and utilize 25 percent or more of that water exclusively for cooling purposes.[487] The new regulations are codified under 40 C.F.R. Part 125, Subpart J, and 40 C.F.R. § 122.21, and establish categorical standards for determining and implementing BTA to minimize impingement and entrainment impacts of CWISs. The final § 316(b) rule modified and combined into a single rulemaking portions of its previous phased CWA § 316(b) rulemakings that had been litigated and remanded following judicial review.[488]

The primary requirements applicable to existing facilities in the final § 316(b) rule include the requirement that any facility with a DIF greater than 2 MGD install one of several approved technologies to reduce fish impingement mortality at its CWIS and the requirement

[484] *See* AR-846 at 61-66.

[485] *See* 79 Fed. Reg. at 48,300.

[486] *Id.* at 48,358.

[487] *See* 40 C.F.R. § 125.91(a).

[488] *See, e.g.,* 79 Fed. Reg. at 48,328.

that any existing facility with an AIF over 125 MGD conduct certain studies regarding entrainment of aquatic organisms in the facility's CWIS that will allow the permitting authority to establish BTA standards for entrainment on a site-specific basis.[489] As an existing facility withdrawing less than 125 MGD AIF, Merrimack Station is subject only to the first of these two primary requirements.

EPA advanced seven "pre-approved" control technologies from which a facility may choose to satisfy the impingement mortality BTA standard.[490] The new regulations also allow facilities to select other technologies upon a demonstration to the permitting authority that the selected technology will perform adequately.[491] The seven delineated control technologies for impingement mortality include:

(1) operate a closed-cycle recirculating system;

(2) operate a CWIS with a designed maximum through-screen design intake velocity of 0.5 fps;

(3) operate a CWIS with actual maximum through-screen design intake velocity of 0.5 fps;

(4) operate an offshore velocity cap if installed before October 14, 2014;

(5) operate a modified traveling screen that incorporates certain protective measures as defined by 40 C.F.R. § 125.92(s);

(6) operate any other combination of technologies, management practices, and operational measures that the permit writer determines is BTA for impingement reduction; and

(7) achieve the specified impingement mortality performance standard.[492]

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[489] *See* 40 C.F.R. § 125.94(a), (c); *id.* at § 122.21(r)(9)-(12).

[490] *See id.* at § 125.94(c).

[491] *See id.* at § 125.94(c)(6), (7).

[492] *See id.* at § 125.94(c)(1)-(7).

Options 1, 2, and 4 are essentially "pre-approved" technologies the implementation of which would not generally require a demonstration to or approval by the permitting authority. Option 3 requires at least daily monitoring of the actual velocity at the screen in perpetuity, and Option 7 requires biological monitoring in perpetuity at a minimum frequency of monthly to demonstrate compliance with the impingement mortality performance standard.[493] If a facility chooses Options 5 or 6 to comply with the rule, it must undertake an "impingement technology performance optimization study."[494] That study takes place after the installation of the chosen impingement technology and following the issuance of a new final NPDES permit (*i.e.*, "post-permit"). The study must include two years of at least monthly impingement mortality monitoring and set forth biological data measuring the reduction in impingement mortality achieved by operation of the chosen compliance option, including a demonstration that operation of the compliance option has been optimized to minimize impingement mortality.[495]

EPA has acknowledged there may be circumstances in which flexibility in the application of the final § 316(b) rule may be necessary.[496] For this reason, EPA has the discretion to determine that no additional controls are needed to meet the BTA impingement mortality standard if the rate of impingement at the facility is *de minimis*.[497] There is not an explicit standard or threshold for when the agency will deem a facility a candidate under the *de minimis* provision.[498] By way of illustration, the final rule provides that a facility might be a candidate for consideration "if [the] facility withdraws less than 50 [MGD] AIF, withdraws less than 5

[493] *See id.* at § 125.94(c)(3), (7).

[494] *See id.* at § 122.21(r)(6)(i), (ii).

[495] *See id.*

[496] 79 Fed. Reg. at 48,309.

[497] 40 C.F.R. § 125.94(c)(11).

[498] *See* 79 Fed. Reg. at 48,309, 48,371.

percent of mean annual flow of the river on which it is located (if on a river or stream), and is not co-located with other facilities with CWISs such that it contributes to a larger share of mean annual flow[.]"[499] EPA explicitly clarifies that "the authority of the Director [to utilize the *de minimis* provision] is not limited to low flow facilities," despite the examples provided.[500] The agency acknowledges the definition of *de minimis* can and should vary on a site-specific basis.[501] Therefore, in order for a facility to avail itself of the *de minimis* provision, it must submit data to EPA indicating its *de minimis* impingement rate.[502]

For entrainment reduction, the final § 316(b) rule establishes regulations requiring the permitting authority to make a site-specific BTA determination—including a possible determination that no entrainment controls at a facility are necessary—after consideration of certain specified factors and based on all available entrainment data for a facility.[503] Specifically, 40 C.F.R. § 125.98(f) states that a permitting authority <u>must</u> consider the following factors in making such a site-specific determination:

(i) Numbers and types of organisms entrained, including, specifically, the numbers and species (or lowest taxonomic classification possible) of Federally-listed, threatened and endangered species, and designated critical habitat (e.g., prey base);

(ii) Impact of changes in particulate emissions or other pollutants associated with entrainment technologies;

(iii) Land availability inasmuch as it relates to the feasibility of entrainment technology;

(iv) Remaining useful plant life; and

[499] 79 Fed. Reg. at 48,309.

[500] *Id.* at 48,371.

[501] *See id.* at 48,371-72.

[502] *See id.*

[503] 40 C.F.R. § 125.94(d).

(v) Quantified and qualitative social benefits and costs of available entrainment technologies when such information on both benefits and costs is of sufficient rigor to make a decision.[504]

In terms of social costs and relative benefits, the "significantly greater than" and "wholly disproportionate" cost-benefit standards at issue in the U.S. Supreme Court's *Entergy Corp. v. Riverkeeper Inc.*[505] opinion remain in effect following promulgation of the final § 316(b) rule. These standards provide a basis for EPA to "reject an otherwise available technology as a BTA standard for entrainment if the social costs are not justified by the social benefits."[506] A more complete discussion of the implication of the costs of a § 316(b) technology compared to its relative benefits is set out in Part III.D.3. below.

In addition to the five aforementioned mandatory factors, the permitting authority <u>may</u> also consider several other factors in reaching a site-specific BTA determination for entrainment, which include:

(i) Entrainment impacts on the waterbody;

(ii) Thermal discharge impacts;

(iii) Credit for reductions in flow associated with the retirement of units occurring within the ten years preceding October 14, 2014;

(iv) Impacts on the reliability of energy delivery within the immediate area;

(v) Impacts on water consumption; and

(vi) Availability of process water, gray water, waste water, reclaimed water, or other waters of appropriate quantity and quality for reuse as cooling water.[507]

The weight given to the mandatory factors may vary depending upon the circumstances of an individual facility.[508]

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[504] *Id.* at § 125.98(f)(2)(i)-(v).

[505] 556 U.S. 208, 225 (2009).

[506] 40 C.F.R. § 125.98(f)(4).

[507] *Id.* § 125.98(f)(3)(i)-(vi).

The permitting authority's consideration of the aforementioned factors in making a BTA determination is to be "based on a [facility's] submission of certain . . . required information" relating to entrainment impacts at a facility.[509] Specifically, to ensure that the permitting authority has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls, the final § 316(b) rule requires any existing facility with "major cooling water withdrawals"—greater than 125 MGD AIF—to collect the following types of entrainment-related information:[510]

> Entrainment Characterization Study: A study of at least two years of entrainment data, identifying and documenting "organisms collected to the lowest taxon possible of all life stages of fish and shellfish that are in the vicinity of the cooling water intake structure(s) and are susceptible to entrainment, including any organisms identified by [EPA], and any species protected under Federal, State, or Tribal law, including threatened and endangered [("T&E")] species with a habitat range that includes waters in the vicinity of the cooling water intake structure";
>
> Comprehensive Technical Feasibility and Cost Evaluation Study: A description of the technical feasibility and incremental costs of candidate entrainment control technologies. The study must include an evaluation of the technical feasibility of closed-cycle cooling ("CCC"), fine-mesh screens with a mesh size of 2 mm or smaller, reuse of water or alternate sources of cooling water, and any other entrainment reduction technologies identified by the applicant or requested by the permitting authority;
>
> Benefits Valuation Study: A detailed discussion of the magnitude of water quality benefits, both monetized and non-monetized, of the entrainment mortality reduction technologies evaluated in the Comprehensive Technical Feasibility and Cost Study, including discussion of recent mitigation efforts already completed and how

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[508] *Id.* § 125.98(f)(2).

[509] *See* 76 Fed. Reg. 22,174, 22,204 (Apr. 20, 2011) (codified at 40 C.F.R. pts. 122 and 125).

[510] *See* 79 Fed. Reg. at 48,309; 40 C.F.R. § 122.21(r)(9); *see also* EPA, Technical Development Document for the Proposed Section 316(b) Phase II Existing Facilities Rule, Dock. ID EPA-HQ-OW-2008-0667-1282, at 7-7 (Mar. 28, 2011) (noting that "the permit writer would have access to all the information necessary for an informed decision about [a site-specific BTA determination] . . . to reduce entrainment mortality at facilities above 125 MGD AIF" because "the facility's permit application must include information to support such an evaluation"). Hereinafter, references to this document will be cited as "Proposed Rule TDD."

these have affected fish abundance and ecosystem viability in the intake structure's area of influence as well as other benefits to the environment and the community; and

Non-water Quality and Other Environmental Impacts Study: A detailed discussion of the changes in non-water quality factors attributed to technologies and/or operational measures considered.[511]

As EPA explained in the final § 316(b) rule, these entrainment study requirements are limited to facilities with actual water withdrawals exceeding 125 MGD because:

> [T]his threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities. EPA concluded that this threshold struck the appropriate balance between the goal of capturing the greatest portion of intake flow while minimizing the study requirements for smaller facilities . . . . The selected threshold would significantly limit facility burden at more than two-thirds of the potentially in-scope facilities while focusing the Director on major cooling water withdrawals.[512]

Stated differently, facilities above the 125 AIF threshold comprise approximately 200 billion of the national total of 222 billion combined AIF gallons, which is why EPA determined in the final § 316(b) rule that it is these larger facilities (*i.e.*, > 125 MGD AIF) that have "the highest likelihood of causing adverse impacts" from entrainment.[513]

Facilities falling below this 125 AIF threshold supposedly are not universally exempt from the entrainment requirements of the final § 316(b) rule, according to EPA. Yet, the agency recognized in its proposed rule that a BTA determination for entrainment at facilities within the 2 MGD DIF to 125 MGD AIF range could very well be "no other technologies beyond

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[511] *See* 40 C.F.R. § 122.21(r)(9)-(13). Discussion of the changes in non-water quality factors attributed to technologies and/or operational measures include but are not expressly limited to evaluating increases and decreases in energy consumption, thermal discharges, air pollutant emissions, water consumption, noise, safety, grid reliability, and facility reliability. *See id.* at § 122.21(r)(12).

[512] EPA Technical Development Document for the Final Section 316(b) Phase II Existing Facilities Rule, Dock. ID EPA-HQ-OW-2008-0667-4138, at 3-8 (May 19, 2014). Hereinafter, references to this document will be cited as "Final Rule TDD."

[513] 79 Fed. Reg. at 48,309.

impingement control . . . because no other technologies are feasible and/or their benefits do not justify their costs."[514] Nevertheless, EPA provided permitting authorities the right to "require reasonable information to make informed decisions at the smaller facilities" regarding what entrainment controls, if any, may be necessary to satisfy the BTA standard.[515]

Regarding implementation, 40 C.F.R. § 125.98(g) provides:

> In the case of permit proceedings begun prior to October 14, 2014 whenever the Director has determined that the information already submitted by the owner or operator of the facility is sufficient, the Director may proceed with a determination of BTA standards for impingement mortality and entrainment without requiring the owner or operator of the facility to submit the information required in 40 C.F.R. 122.21(r) . . . . In making the decision on whether to require additional information from the applicant, and what BTA requirements to include in the applicant's permit for impingement mortality and site-specific entrainment, the Director should consider whether any of the information at 40 C.F.R. 122.21(r) is necessary.[516]

EPA has determined it "has sufficient information in the record to determine the BTA requirements for the Merrimack Station permit" and does not need any of the additional permit application information described in 40 C.F.R. § 122.21(r) to support its permit decision.[517]

B. EPA Is Obligated to Apply the Requirements of the 2014 Final CWA § 316(b) Rule

In its Statement, EPA requests comments on a series of questions regarding whether, and to what extent, the agency should apply the standards of the 2014 final § 316(b) rule. PSNH responds in detail to each such question below. However, the Company's positions on these issues are simple: EPA should apply each and every standard of the 2014 final § 316(b) rule to the CWISs at Merrimack Station. The final rule was promulgated by the agency to establish a

[514] 76 Fed. Reg. at 22,005.

[515] 79 Fed. Reg. at 48,309.

[516] 40 C.F.R. § 125.98(g).

[517] *See* AR-1534 at 16.

single, uniform set of standards to regulate every CWIS within the industry. It would therefore be patently unfair to not apply the rule and incongruent with the rule to cherry-pick limited provisions from it, causing Merrimack Station to be regulated differently than every other facility.

1. EPA No Longer Possesses the Authority to Determine BTA Utilizing BPJ Authority

The regulations set out in the agency's 2014 final § 316(b) rule must govern the Final Permit for Merrimack Station. EPA does not enjoy any level of discretion on this issue. PSNH previously articulated this fact[518] and EPA correctly notes in its Statement that "these [2014 § 316(b)] regulations are now in effect and govern the Final Permit for Merrimack Station."[519] BPJ-based case-by-case § 316(b) determinations like those included in EPA's 2011 draft of the NPDES permit for Merrimack Station are only proper when national regulations have not been set. Courts, the EAB, and EPA have all established that the CWA does not allow for permit limits based on the agency's BPJ once uniform, technology-based standards for a source category are established.[520]

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[518] *See, e.g.,* AR-1231 at 25-34.

[519] AR-1534 at 14.

[520] *See e.g.*, *Natural Res. Def. Council, Inc. v. EPA,* 859 F.2d 156, 200 (D.C. Cir. 1988) (providing that CWA § 402(a)(1) "preclude[s] the establishment of BPJ permit limits once applicable effluent guidelines are in place"); *Natural Res. Def. Council, Inc. v. EPA*, 822 F.2d 104, 111 (D.C. Cir. 1987) (noting that a state or permit writer may set limitations utilizing its BPJ authority only when there is no national standard that has been promulgated for a point-source category); *Riverkeeper, Inc. v. EPA*, 358 F.3d 174, 203 (2d Cir. 2004) ("It is, of course, true that once the EPA promulgates applicable standards, regulation of those facilities subject to those standards on a [BPJ] basis must cease . . ."); *Citizens Coal Council v. EPA*, 447 F.3d 879, 891 n.11 (6th Cir. 2006) (noting that BPJ applies only when "EPA has not promulgated an applicable guideline"); *see also* Letter from Jim Hanlon, Director, Office of Wastewater Management, to Water Division Directors Regions 1-10, Attachment A, at 1 (June 7, 2010) (acknowledging that BPJ-based limits are only to be included in permits "until such time [as the ELGs are] promulgated") (attached hereto as Exhibit 16); *In re: Certainteed Corporation*, NPDES Appeal No. 15-01, 2015 WL 10091224, at *1 (EAB May 7, 2015) ("If EPA has developed industrial category-wide (or subcategory-wide) effluent limitations — referred to as 'effluent limitation guidelines' [] — such limits must be included in that facility's permit.") (citing 40 C.F.R. § 125.3(c)(1) & *E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112 (1977)); H.R. Rep. No. 92-911, at 126 (1972), *reprinted in* A Legislative History of the Water Pollution Control Act Amendments of 1972 at 813 (1973) (providing that permits with BPJ limits may be issued only "prior to" the promulgation of nationally applicable effluent guidelines).

EPA's final § 316(b) rule was promulgated on August 15, 2014. Over three years have since elapsed and the NPDES permit for Merrimack Station has not yet been finalized. Attempting to single out Merrimack Station and apply a divergent set of standards to this singular facility would be arbitrary, capricious, and patently unfair. EPA appropriately acknowledges in its Statement that the agency has no choice but to apply these industry-uniform regulations to the Final Permit. PSNH agrees.

2. EPA Should Consider All of the Regulatory Factors Set Out in the 2014 Final CWA § 316(b) Rule

The 2014 final § 316(b) rule purports to give permit writers discretion in "ongoing permitting proceedings" to apply less than all of the entrainment factors and BTA standards for impingement mortality.[521] Specifically, the regulation provides that "[t]he Director's BTA determination may be based on some or all of the factors in [40 C.F.R. § 125.98](f)(2) and (3) . . . and the BTA standards for impingement mortality at § 125.95(c)."[522] EPA acknowledges this regulation in its Statement but essentially disclaims that it has or will render its BTA determination for Merrimack Station based on less than all the factors and standards set out in the final § 316(b) rule:

> EPA's 2011 Draft Permit . . . analysis effectively considered all of the § 125.98(f)(2) and (3) factors, as well as the technologies specified in 40 C.F.R. § 125.94(c), in rendering its proposed BTA determination . . . EPA also expects to consider the § 125.98(f)(2) and (3) factors, as well as the BTA standards for controlling impingement mortality specified in § 125.94(c), in rendering its BTA determination for Merrimack Station's Final Permit.[523]

PSNH supports EPA's decision on this issue. Rules such as the final § 316(b) rule are promulgated to establish a uniform set of standards and equal playing-field for all facilities

[521] *See* 40 C.F.R. § 125.98(g).

[522] *Id.*

[523] AR-1534 at 16-17.

within an industry. It would therefore be counterproductive and prejudicial to regulate Merrimack Station by an incomplete set of factors or an altogether different set of criteria. The fact that more than three years (or more than half a standard permit cycle) have now passed since EPA promulgated the final § 316(b) rule further bolsters this conclusion, as the intent of 40 C.F.R. § 125.98(g) must be construed to apply to only those permit proceedings wherein the permit writer had almost concluded responding to comments and the final permit was days away from being finalized when the final § 316(b) rule became effective.

Application of all the final § 316(b) rule factors and standards in this permit renewal proceeding is also prudent because, in a practical sense, the BTA analysis was started anew by EPA's Statement. EPA has essentially reversed course on its BTA determination by renewing its consideration of wedgewire screen technologies as a feasible and effective option for Merrimack Station. In its 2011 Draft Permit, EPA utilized its BPJ authority to determine that PSNH must limit the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in a CCC mode from, at a minimum, April 1 through August 31 of each year. Despite PSNH identifying cylindrical wedgewire screens as a feasible technology in its submissions to EPA prior to the issuance of the 2011 Draft Permit, the agency rejected the technology and insisted on a CCC system as the BTA to control for entrainment and impingement mortality. EPA is now reconsidering its determination and examining wedgewire screens as the possible BTA for Merrimack Station. Such a shift—from rejecting a technology altogether to then considering its use—demonstrates the permitting agency is essentially starting over in its decision-making, and therefore, should apply all the regulatory factors set out in the 2014 final § 316(b) rule.

3. EPA Must Consider Additional 40 C.F.R. § 122.21(r) Studies Submitted Along With These Comments Before Rendering its BTA Determination

Since the AIF of the CWISs at Merrimack Station is below the 125 MGD AIF compliance threshold established in the final § 316(b) rule and because entrainment at Merrimack Station is *de minimis*, technological installations to address entrainment at Merrimack Station are unwarranted.[524] Should EPA improperly reject this conclusion, the agency must consider the analyses submitted by PSNH contemporaneously with these comments to provide EPA at least the minimum amount of information the agency would need to make a reasoned and legally defensible BTA entrainment determination in accordance with the final § 316(b) rule.

The final § 316(b) rule requires that "BTA standards for entrainment . . . reflect the [permitting authority's] determination of the maximum reduction in entrainment warranted after consideration of the relevant factors as specified in § 125.98."[525] PSNH has not previously submitted to EPA a number of fundamental analyses the agency would need to adequately assess the factors set out in § 125.98 and make a rational BTA determination for entrainment at Merrimack Station. These analyses have not previously been completed because EPA has not requested them and because they are not mandated by the final § 316(b) rule for facilities with AIFs equivalent to those at Merrimack Station.[526] However, without these essential analyses, EPA cannot possibly render a reasonable and rational BTA determination for entrainment.

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[524] The significance of the 125 MGD AIF threshold, as well as the facts supporting a determination that entrainment at Merrimack Station is *de minimis* are discussed in Sections III.C.2. & 3., respectively, below.

[525] 40 C.F.R. § 125.94(d); *see also* 79 Fed. Reg. at 48,330 ("While site-specific permit requirements are not new, what is different about this approach from the current requirement for permits to include 316(b) conditions is that for the first time, EPA is establishing a detailed specific framework for determining BTA entrainment control requirements. Thus, the rule identifies what information must be submitted in the permit application, prescribes procedures that the Director must follow in decision making and factors that must be considered in determining what entrainment controls and associated requirements are BTA on a site-specific basis.").

[526] 40 C.F.R. §§ 122.21(r)(1)(ii)(C) and 125.98(i) provide EPA discretionary authority to compel PSNH to submit any additional information the agency determines is necessary for determining permit conditions and requirements. EPA has made no such requests of PSNH for this permit renewal proceeding.

The final § 316(b) rule requires operators with CWISs to submit an array of information with their NPDES permit application.[527] Some application requirements apply to "all existing facilities" while others apply only to existing facilities that withdraw greater than 125 MGD AIF of water for cooling purposes.[528] To ensure a permitting authority has access to the information necessary to make an informed BTA determination about a facility's site-specific entrainment controls, the final § 316(b) rule requires any existing facility with "major cooling water withdrawals"—greater than 125 MGD AIF—to collect entrainment-related information, including an Entrainment Characterization Study, Comprehensive Technical Feasibility and Cost Evaluation Study, Benefits Valuation Study, and Non-water Quality and Other Environmental Impacts Study.[529]

As mentioned above, EPA has not asked PSNH to submit any of the aforementioned entrainment studies required by the final § 316(b) rule. Instead, it states it "has sufficient information in the record to determine the BTA requirements for the Merrimack Station permit."[530] This decision is arbitrary and capricious and not supported by the facts. While PSNH has over the years provided to EPA a number of comprehensive biological studies that likely satisfy the Entrainment Characterization Study requirement of the final § 316(b) rule,[531] as well as a host of reports and responses to CWA § 308 information requests that could constitute a satisfactory Comprehensive Technical Feasibility and Cost Evaluation Study,[532] a Benefits

[527] *See generally id.* at § 122.21(r).

[528] *See, e.g.*, *id.* § 122.21(r)(1)(ii)(A), (B).

[529] *See* 79 Fed. Reg. at 48,309; *id.* § 122.21(r)(9)-(12).

[530] AR-1534 at 16.

[531] *See, e.g.*, AR-1154.

[532] *See, e.g.*, AR-6. Notably, the discussions in many if not all such reports and responses previously submitted by PSNH and/or its consultants may be outdated and may not include all the cost-related details required by 40 C.F.R. § 122.21(r)(10)(iii).

Valuation Study and Non-water Quality and Other Environmental Impacts Study addressing the specific requirements of the final § 316(b) rule have not previously been submitted by the Company.[533] EPA must consider these two additional types of reports given the agency explicitly stated it intends to apply each and every standard of the 2014 final § 316(b) rule to the CWISs at Merrimack Station.

A report prepared by NERA Economic Consulting ("NERA") has been submitted along with these comments that addresses many of the requirements of the Benefits Valuation Study.[534] A Benefits Valuation Study evaluates the magnitude of water quality benefits, both monetized and non-monetized, of the entrainment mortality reduction technologies evaluated in the Comprehensive Technical Feasibility and Cost Study. It includes discussion of recent mitigation efforts already completed and how these have affected fish abundance and ecosystem viability in the intake structure's area of influence as well as other benefits to the environment and the community. Benefits are quantified in physical or biological units and monetized using appropriate economic valuation methods. The study also identifies other benefits to the environment and nearby community, including improvements for mammals, birds, and other organisms and aquatic habitats.[535] NERA's robust study uses data from Normandeau's previous

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[533] The Company has previously submitted analyses, reports, and/or comments that address these topics. These materials predate the 2014 final § 316(b) rule, however, and therefore were not prepared to satisfy all of the requirements of the new regulations.

[534] *See generally* NERA Economic Consulting, Economic Evaluation of Two Entrainment Reduction Technologies at Merrimack Station (Dec. 2017). This report is attached hereto as Exhibit 17. Hereinafter, references to this document will be cited as "NERA 2017 Report." This report also addresses the cost-related requirements of 40 C.F.R. § 122.21(r)(10)(iii). *See id.* Attached hereto as Exhibits 18 and 19, respectively, are a memorandum from Enercon Services, Inc. to NERA entitled Technical Memorandum to Document Technology Cost Inputs for Merrimack Station (Dec. 13, 2017) ("Enercon Technology Cost Inputs Memo") and Normandeau Associates, Inc., Biological Benefit Evaluation of Entrainment Reducing Technologies at Merrimack Station (Dec. 11, 2017). These two documents provide factual information utilized in NERA's analyses.

[535] *See* 40 C.F.R. § 122.21(r)(11).

biological studies, benefits information Normandeau provided directly to NERA to support its analyses, and technological cost information provided by Enercon.[536]

Several aspects of a Non-water Quality and Other Environmental Impacts Study required by the final § 316(b) rule are addressed in the Enercon 2017 Comments, which have been submitted along with these comments.[537] The final § 316(b) rule specifies that a Non-water Quality Environmental and Other Impacts Study must discuss changes in environmental and other factors not water quality-related that are attributed to the candidate technologies or operational measures. Potential impacts that are to be evaluated include, but are not limited to, energy consumption, air pollution, noise, safety concerns, grid reliability, plant reliability, consumptive water use, impacts of construction, aesthetic impacts, environmental justice, archaeological and historical resources, and other permitting impacts. Evaluation of these concerns puts CWIS technological options being considered into proper perspective by quantifying the totality of environmental impacts expected if a technology is implemented at a facility. This ensures that a technology that is better from a CWA perspective is not worse overall for the environment.

As stated at the outset and discussed in detail below, PSNH maintains that additional technological controls at Merrimack Station to address entrainment are unwarranted. Nevertheless, if EPA intends to require PSNH to incorporate entrainment controls at the facility, the agency's previous assertion that BTA for entrainment has been fully evaluated is arbitrary and capricious. Only after EPA considers the reports prepared by NERA and Enercon will the agency have some information that at least addresses the 40 C.F.R. 122.21(r)(9) through (r)(12) requirements so it can attempt to evaluate all of the mandatory BTA factors set out in 40 C.F.R.

[536] *See generally* NERA 2017 Report.

[537] *See generally* Enercon 2017 Comments.

§ 125.98(f).[538] Without them, EPA cannot and has not rendered a BTA determination that can withstand judicial scrutiny.

C. Existing CWIS Technologies and Operations at Merrimack Station Constitute BTA

PSNH established in its February 2012 comments to EPA's 2011 Draft Permit that the existing technologies at Merrimack Station constitute BTA under a complete and reasoned BPJ analysis. Specifically, PSNH provided that "[a] proper BTA analysis demonstrates that 1) rescheduling maintenance outages for Units 1 and 2 at Merrimack Station; 2) installation of a new fish return system; and 3) continuous operation of existing traveling screens from April through December, collectively, constitute BTA for § 316(b)."[539] The requirements of the 2014 final § 316(b) rule do not negate this conclusion. In fact, the 2014 final § 316(b) rule dictates that continued use and operation of existing CWIS technologies (*i.e.*, use of existing traveling screens and the current fish return system) is all that is required to satisfy the BTA standard.[540] This is so because: (1) the rate of impingement at Merrimack Station is *de minimis*, meaning no additional controls are needed to satisfy the BTA impingement mortality standard;[541] (2) the 3-year average AIF at Merrimack Station is below the 125 MGD compliance threshold EPA set out in the final § 316(b) rule for addressing entrainment mortality; and (3) entrainment is *de minimis* at Merrimack Station, even if EPA does not summarily conclude no entrainment controls are

[538] In fact, one could argue EPA needs more specific and/or detailed information regarding entrainment at Merrimack Station because the agency's maximum potential reduction in entrainment impacts is diminutive compared to the maximum potential at facilities with an average AIF of 125 MGD or more—where impacts due to entrainment may more rationally be assumed and corresponding, meaningful reductions in entrainment can therefore be expected. At facilities with an AIF below 125 MGD, like Merrimack Station, EPA is forced to make an arguably more difficult and precise determination regarding entrainment compliance when compared to larger-flow facilities already presumed to have a significant impact due to entrainment, meaning the agency has a very small margin for error in reaching a reasonable entrainment BTA determination.

[539] AR-846 at 113.

[540] Although, PSNH may still consider upgrading its fish return system to address identified issues with the current system.

[541] *See* 40 C.F.R. § 125.94(c)(11).

needed at Merrimack Station based on the 125 MGD AIF compliance threshold established in the final § 316(b) rule.

1. The Rate of Impingement at Merrimack Station is *De Minimis*

Existing CWIS controls at Merrimack Station constitute BTA for impingement because the rate of impingement at Merrimack Station is *de minimis*.[542] PSNH demonstrated in its 2012 comments to the Draft Permit that the rate or level of impingement experienced at Merrimack Station cannot be anything other than *de minimis* and is not resulting in any adverse environmental impact ("AEI") within the Hooksett Pool.[543] To support this argument, PSNH utilized comprehensive biological sampling at Merrimack Station completed by Normandeau between 2005 and 2007. That data allowed Normandeau to estimate that Merrimack Station impinged 6,736 fish between June 2005 and June 2006 and only 1,271 fish between July 2006 and June 2007—resulting in an estimated impingement of approximately 4,005 fish in an average year.[544] To further bolster its conclusions that the rate of impingement at Merrimack Station is *de minimis*, Normandeau next converted the raw numbers for the six species that comprise in excess of 90 percent of this estimated total number of fish impinged in an average year at Merrimack Station and calculated the annual, expected adult equivalent losses due to the estimated impingement to be a mere 517 adult fish lost in an average year due to AIF at Merrimack Station. These numbers are miniscule when one considers the natural mortality of early lifestages of fish, and the exorbitant number of eggs fish produce each season, absent outside influences.

[542] Should EPA erroneously disagree with this conclusion, the owner or operator of the facility has the right and obligation to choose the method of compliance with the impingement mortality standard. *See id.* at § 122.21(r)(6).

[543] *See, e.g.,* AR-846 at 73-82.

[544] *Id.* at 74 (citing AR-6 at 6).

This conclusion was corroborated by PSNH in its 2012 comments by referencing an EPRI study that analyzed the economic benefits of retrofitting existing once-through cooling facilities with CCC.[545] In this study, EPRI gathered and ranked impingement data from 166 facilities with CWISs in the same regulatory category as those at Merrimack Station.[546] Merrimack Station's average annual impingement ranked 136 out of 166 facilities in EPRI's study, meaning the incidence of impingement at the facility was in the bottom 18 percent of all facilities in the database.[547] Remarkably, the total annual impingement from the 30 facilities ranked at the bottom of EPRI's database accounted for only 0.02 percent (two ten thousandths) of the impingement for all 166 facilities—demonstrating that problematic rates of impingement are limited to a specific subset of CWISs within this regulatory category—and the Merrimack Station CWISs are not within this problematic subset.[548]

Normandeau revisited this *de minimis* issue in an October 22, 2014 report submitted to EPA to examine how, if at all, its previous *de minimis* analysis should be revised in light of the 2014 final § 316(b) rule.[549] Normandeau embraced the illustrative *de minimis* flow-based examples in the final § 316(b) rule to support its 2012 conclusions. Utilizing the mean annual flow ("MAF") of the Merrimack River (4,927 cubic feet per second ("cfs")) from 1996 to 2003, Normandeau determined the Unit 1 DIF of 131 cfs withdraws 2.67% of the MAF, and the Unit 2 DIF of 312 cfs withdraws 6.33% of the MAF.[550]

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[545] *See* AR-846 at 81 (citing AR-842 at 7-9). EPRI's economic benefits study is described in more detail in its comments to the 2012 Draft Permit. *See* AR-842.

[546] These 166 facilities comprised 39 percent of the total population of facilities with CWISs that fall within the same regulatory category as the CWISs at Merrimack Station. *Id.* at 7.

[547] *Id.*

[548] *See id.*

[549] *See* AR-1231, Ex. 4, Attachment 1 at 8-10.

[550] *Id.* at 9.

The final § 316(b) rule does not utilize DIF in its *de minimis* examples, however. Instead, EPA recommends considering average AIFs,[551] which are significantly lower at Merrimack Station—especially in the last 4-7 years. Specifically, Merrimack Station Unit 1 had an AIF of 97 cfs in the 2005 through 2007 timeframe. MAF of the Merrimack River during this time was 7,241 cfs, meaning the 97 cfs of Unit 1 was a mere 1.34% of the total River MAF.[552] Unit 2's AIF during this same time period was 251 cfs, which amounts to 3.47% of the Merrimack River MAF. Utilizing the more conservative 4,927 cfs MAF from 1996 to 2003, the AIF withdrawals from 2005 through 2007 are still a mere 1.97% and 5.09% for Unit 1 and 2, respectively.[553] Normandeau also looked at the most recent three years of Merrimack Station CWIS operations at the time, from 2011 through 2013. Unit 1 had an AIF of 56 cfs, or 1.11% of the MAF of 5,021 cfs for the Merrimack River during those years. Unit 2's AIF during this period was 119 cfs, or 2.37% of the Merrimack River MAF. Utilizing again the more conservative 4,927 cfs MAF from 1996 to 2003, the AIF withdrawals from 2011 through 2013 represent 1.14% and 2.42% for Unit 1 and 2, respectively.[554] All of these examples are within the 5% percent or less MAF withdrawal percentage EPA set out in the final § 316(b) rule and support a conclusion that the rate of impingement at Merrimack Station is *de minimis*.

Furthermore, Normandeau's 2014 report provides the following additional support that the rate of impingement at Merrimack Station must be considered *de minimis*:

> An impingement characterization study was performed at Units 1 and 2 of Merrimack Station from 29 June 2005 through 28 June 2007, weekly during April through December and on alternate weeks during January through March (Normandeau 2007),

[551] *See, e.g.,* 79 Fed. Reg. at 48,309.

[552] AR-1231, Ex. 4, Attachment 1 at 9.

[553] *Id.*

[554] *Id.*

> providing recent and relevant data for estimating impingement abundance. Merrimack Station weekly AIFs have been reduced by about 50% since the 2005 through 2007 Study, by reducing the operation of Units 1 and 2, making the weekly average AIF from Merrimack Station from 1 January 2011 through 31 December 2013 the most current and appropriate CWIS operating regime to estimate impingement abundance and mortality for compliance with the new §316(b) regulations . . . .
>
> Weekly impingement rates (density as number of fish impinged per million gallons of water sampled, adjusted for collection efficiency; Appendix Tables B-3 and B-4 of Normandeau 2007) at each Unit (1 or 2) from the 2005 through 2007 Study were multiplied by the associated weekly AIF from Merrimack Station for 1 January 2011 through 31 December 2013 . . . to estimate the current weekly and annual impingement abundance of fish for the two units combined . . . . Fish species impinged at Merrimack Station during the 29 June 2005 through 28 June 2007 Study were also categorized as fragile or nonfragile species according to the specifications of §125.92(m) of the new §316(b) regulations. The only species impinged at Merrimack Station classified as a fragile species was Rainbow Smelt, which accounted for only 2.3% of the total estimated fish impingement over the two-year study (Table A1-3). Annual impingement abundance of total fish at Merrimack Station was reduced by 54% in 2011 through 2013 (compared to the 2005 through 2007 study . . .) due to the recent flow reductions.[555]

To provide proper perspective, Normandeau likewise references the above-referenced 2011 EPRI national survey to highlight the averaged annual impingement rate from its 2005 through 2007 study at Merrimack Station is *de minimis*. Applying numbers that are slightly different than those included in PSNH's 2012 comments to the Draft Permit, Normandeau provides:

> The Merrimack Station annual impingement rate averaged over the two years of study (29 June 2005 through 28 June 2007) was 3,978 fish for Unit 1 and Unit 2 combined (Table A1-2), ranking 139th among the 166 facilities responding to the EPRI national survey . . . . Merrimack Station had an annual total far below (0.27% of) the national average. In terms of rank this 2005 through 2007 annual average impingement rate places Merrimack Station in the lowest 17% of the facilities surveyed throughout the United States

[555] *Id.* at 8.

> that had performed impingement characterization studies during the 2004 through 2007 period . . . . Based on the most recent and relevant intake flows from 1 January 2011 through 31 December 2013 applied to the weekly impingement rates from the 29 June 2005 through 28 June 2007 Study . . ., the Merrimack Station annual impingement rate was 1,834 fish for Unit 1 and Unit 2 combined . . ., which was in the **lowest 11%** of the facilities surveyed throughout the United States that had performed impingement characterization studies during the 2004 through 2007 period. Therefore, by comparison with the largest data base of reported annual impingement rates presently available from 166 electric generating facilities representative of all source water bodies throughout the continental United States and Hawaii (EPRI 2011), and using annual total impingement rates for the three most recent years of AIF (2011-2013), impingement abundance at Merrimack Station of 0.27% of the national average is *de minimis*.[556]

Taken together, these data and analyses demonstrate that the rate of impingement at Merrimack Station is *de minimis*. Accordingly, existing CWIS controls and operations at Merrimack Station constitute BTA and additional technologies at the facility are not required.

2. PSNH Should Not Be Required to Address Entrainment Mortality Given Its Average AIF Over the Last 3 Years Is Less Than 125 MGD

Current CWIS technologies and operations at Merrimack Station constitute BTA because the final § 316(b) rule establishes PSNH is not required to address entrainment mortality. Specifically, Merrimack Station is not subject to entrainment controls because the 3-year average AIF at the facility falls below the 125 MGD compliance threshold EPA established in the final § 316(b) rule. In this rule, BTA for entrainment is to be determined on a site-specific basis, including a potential conclusion that no entrainment controls at a facility are necessary—especially for those facilities falling below this 125 MGD AIF. As mentioned above, the regulations require only those facilities with "major cooling water withdrawals"—*i.e.*, an average greater than 125 MGD AIF over the past three years—to submit a robust series of analyses to

[556] *Id.* at 10 (emphasis added). Normandeau again references data from its 2014 report in its report submitted with these comments. *See* Normandeau 2017 Response at 27.

their respective permit writers as part of the regulatory entrainment mortality assessment because EPA believes it is these facilities that have the highest likelihood of causing adverse entrainment impacts.[557] The three-year average AIF (2014-2016) of the CWISs at Merrimack Station is 69.6 MGD, well below the 125 MGD AIF compliance threshold EPA established in the final § 316(b) rule. Consequently, Merrimack Station should not be subject to entrainment controls.[558]

EPA's reason for establishing this compliance threshold for entrainment is well founded. EPA found that all of the facilities, like Merrimack Station, withdrawing less than this amount, combined, represent only 10 percent of the nationwide potential for AEI from entrainment, despite comprising approximately 70 percent of all facilities potentially subject to the final § 316(b) rule.[559] EPA logically concluded in the final rule that the 125 MGD AIF threshold is therefore "justified on a technical basis" and was selected for the purpose of "focus[ing] on the facilities with the highest intake flows and the highest likelihood of causing adverse impacts."[560] The final rule recognized that facilities, like Merrimack Station, that withdraw fewer than 125 MGD AIF are far less likely to cause entrainment impacts, and it makes practical sense to allow permitting authorities the discretion to require submission of the entrainment studies to make an informed and legally defensible entrainment determination, which often may be that no entrainment controls are justified at all.[561]

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[557] *See, e.g.*, 79 Fed. Reg. at 48,309.

[558] The final § 316(b) rule clearly provides the three-year average 125 MGD threshold is to be based on a facility's actual (versus design) conditions. It would therefore be improper for EPA to construe PSNH's position as seeking a cap on capacity utilization at the facility or in any way suggesting such a cap would be an acceptable condition to the permit. It would not be an acceptable condition.

[559] *See id.*; *see also* Final Rule TDD at 3-8 (providing that the 125 MGD AIF "threshold will capture 90 percent of the actual flows but will apply only to 30 percent of existing facilities").

[560] 79 Fed. Reg. at 48,309.

[561] *See id.* at 48,309-10.

EPA recognized in the preamble to the final § 316(b) rule that it is possible a permitting authority may find it necessary to require entrainment compliance for a facility with an average AIF below 125 MGD.[562] However, it is clear that EPA expected this to be the exception and not the norm for such facilities because it went to great lengths to explain that the 125 AIF threshold was created to differentiate between larger facilities whose water withdrawals likely pose a significant risk of AEI due to entrainment from those whose withdrawals do not. Were the final rule and/or the agency to presuppose that facilities withdrawing less than 125 MGD AIF would be subject to the same entrainment requirements as those above that intake threshold, EPA's establishment of the threshold in the first place would be wholly arbitrary, capricious, and as a practical matter, pointless. Therefore, while exemption from entrainment controls is not "automatic," the final rule, at a minimum, presupposes that a facility withdrawing less than 125 MGD AIF likely represents little to no impact to aquatic organisms and thus need not specifically be forced to install costly entrainment compliance controls unless the information available to a permitting authority in fact indicates otherwise.

EPA promulgated entrainment control standards in the final rule to "establish[] a detailed specific framework for determining BTA entrainment control requirements," a critical component of which is requiring that certain information be collected by the facility and submitted to the permitting authority for consideration in making the BTA determination on a site-specific basis.[563] Indeed, EPA requires that entrainment BTA determinations be based upon the specific information provided in a number of specific studies that only facilities withdrawing greater than 125 MGD AIF are required to collect and submit. EPA's Technical Development

[562] *Id.* at 48,361 ("not[ing] that facilities below the 125 [MGD] threshold are not automatically exempt from entrainment requirements").

[563] *Id.* at 48,330.

Document accompanying the final § 316(b) rule highlights the importance of the permitting authority's access to these site-specific studies, explaining the purpose of the requirement is to allow "the permit writer [to] have access to all the information necessary for an informed decision about [a site-specific BTA determination] . . . to reduce entrainment mortality at facilities above 125 MGD AIF."[564] Thus, the requirement to collect and submit specific information about entrainment impacts is inherently tied to the underlying entrainment BTA requirements.

Exempting a facility from submitting "information necessary for an informed decision" about the appropriateness of entrainment controls, yet purporting to make such a decision in the absence of that "necessary" information, defies logic and defeats the purpose of the entrainment study requirement altogether. Permitting authorities enjoy discretion to request specific entrainment-related information from a facility with an AIF below 125 MGD.[565] Yet, EPA has not requested entrainment studies delineated in the final § 316(b) rule from PSNH. Instead, EPA has determined the studies the Company submitted prior to the promulgation of the final § 316(b) rule are sufficient—an assertion PSNH has critiqued in these comments as invalid, arbitrary and capricious.

It is clear from EPA's discussion of the 125 MGD AIF threshold in the final § 316(b) rule that facilities like Merrimack Station should be exempt from addressing entrainment absent some compelling site-specific information demonstrating actual entrainment mortality at the facility greatly exceeds what is common for facilities that withdraw less than 125 MGD. EPA has not presented or advanced any compelling site-specific information establishing entrainment at Merrimack Station exceeds some critical point, meaning entrainment controls are necessary. In

[564] Proposed Rule TDD at 7-7 (emphasis added).

[565] 79 Fed. Reg. at 48,309.

fact, the evidence in the administrative record leads to the opposite conclusion. In the absence of concrete, problematic entrainment information, the 125 MGD AIF compliance threshold promulgated only three years ago by the agency dictates that Merrimack Station is one of the approximately 70 percent of all facilities subject to the final § 316(b) rule that present a negligible risk of environmental impact due to entrainment and that no technological controls are therefore necessary at the facility.

3. Entrainment at Merrimack Station Is *De Minimis*

Normandeau has concluded time and again that the levels of entrainment at Merrimack Station are *de minimis*.[566] The rationale for Normandeau's conclusions are fully set out in its reports and were summarized by PSNH in its comments to the 2011 Draft Permit.[567] In short, Normandeau's comprehensive biological sampling between 2005 to 2007 revealed that an estimated 2.95 million ichthyoplankton were entrained at Merrimack Station in 2006 and approximately 2.5 million were actually entrained in 2007 based on AIF numbers.[568]

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[566] *See* AR-1170 at 141-143; *see generally* AR-2.

[567] *See* AR-846 at 75-82; *see generally* AR-6. Also included in PSNH's comments, as well as Normandeau's comments to the 2011 Draft Permit (AR-1170), are a number of points of contention between EPA and Normandeau regarding the collection and/or analyzing methods Normandeau employed in its studies. *See, e.g.,* AR-846 at 75-80. EPA has never responded to the comments and critiques set out in the 2012 comments from PSNH and Normandeau and failed again to do so in the agency's Statement. These comments and critiques are well-founded and remain valid.

Notably, EPA's 2011 criticism of Normandeau's use of the adult equivalency method has since been undercut by the agency's 2014 final § 316(b) rule. In that rule, EPA specifically acknowledges that *de minimis* analyses may utilize an "age-one equivalent count" because:

> [I]nformation in the record indicates that an overwhelming majority of eggs, larvae and juveniles do not survive into adulthood and the [age-one equivalent count ("A1E")] calculations adjust for differences in survivorship based on species and age-specific mortality rates. EPA recognizes that using A1Es simplifies a complex ecological situation, because some of the smaller fish would provide an ecological benefit to other species as food even if they would not survive to adulthood. Recognizing this as one nonmonetized benefit in the analysis, using an A1E approach is the most reasonable approach available because to date, there is insufficient data to account for the extent to which organisms that do not survive to adulthood provide a benefit to other organisms which can be reliably monetized.

See 79 Fed. Reg. at 48,371, 48,403.

[568] *See* AR-2.

Normandeau took these estimated, actual entrainment numbers and calculated the potential entrainment estimations if the plant's CWISs operated at maximum DIF capacity throughout the year. This analysis forecast that less than 3.5 million ichthyoplankton would be entrained in an average year.[569]

Normandeau next calculated the annual, expected adult equivalent losses due to the estimated entrainment based on AIF to put the raw entrainment number into proper perspective by accounting for the natural mortality of early lifestages of fish, coupled with the exorbitant number of eggs fish produce each season. Utilizing the raw numbers for the six species that comprise in excess of 90 percent of the total fish impinged and entrained in an average year at Merrimack Station, Normandeau calculated that 14,061 adult fish would be lost in an average year due to entrainment of ichthyoplankton at the plant based on AIF.[570]

PSNH compared these entrainment numbers in its comments to the 2011 Draft Permit to the same EPRI study referenced in Part III.C.1., above, to illustrate how trivial they are compared to the breadth of facilities subject to the CWIS regulations.[571] EPRI collected entrainment data from 90 facilities and Merrimack Station's annual entrainment estimate ranked 75 out of 90 facilities, meaning it is in the bottom 17 percent of all facilities in the database.[572] Notably, the entrainment losses from the 16 facilities ranked at the bottom of EPRI's database made up a mere 0.04 percent (four ten thousandths) of the entrainment losses from all 90 facilities that provided entrainment data for the EPRI study.[573]

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[569] *See* AR-6 at 12.

[570] *Id.* at 4.

[571] AR-846 at 81.

[572] *Id.* (citing AR-842 at 7).

[573] *Id.* (citing AR-842 at 7).

The *de minimis* exception set out the 2014 final § 316(b) rule further bolsters the conclusion that entrainment is *de minimis* at Merrimack Station. While the regulatory provision and MAF-based examples provided in the final rule apply principally to impingement, EPA makes clear the only reason the "specific regulatory language for *de minimis* entrainment was" not included in the final rule is because "the entrainment requirements are already determined" on a site-specific basis, meaning the permit writer has the opportunity to take into consideration any and all unique characteristics of a given facility—including those that support a finding that entrainment is *de minimis*.[574] Accordingly, the 2014 Normandeau analysis described in Part III.C.1., above—demonstrating that the AIF of Units 1 and 2 have collectively accounted for less than five percent of the MAF of the Merrimack River over the entire course of Normandeau's data sets—applies equally to assessing what impacts, if any, have been caused by entrainment. This too supports a conclusion that the levels of entrainment at Merrimack Station are *de minimis*.

Taken together, these comprehensive analyses—coupled with the breadth of additional evidence and data included in the administrative record—unquestionably demonstrate that entrainment levels at Merrimack Station are *de minimis* and that no additional CWIS technologies and/or controls are necessary to satisfy the § 316(b) BTA standard.

D. Wedgewire Screens Are a Feasible Technology for Merrimack Station but the Costs are Wholly Disproportionate to the Benefits of Reducing the Already *De Minimis* Impingement and Entrainment

As explained above, PSNH is not required to address entrainment mortality at Merrimack Station because (1) the daily AIF at the facility falls below the 125 MGD compliance threshold EPA established in the final § 316(b) rule, and (2) the rate of entrainment at Merrimack Station is

[574] 79 Fed. Reg. at 48,372.

de minimis. Merrimack Station also is not required to select one of the seven pre-approved impingement mortality options set out in 40 C.F.R. § 125.94(c), because the rate of impingement at the Station is *de minimis*. PSNH's existing CWIS technologies—traveling screens and its existing fish return system—satisfy the requirements of § 316(b). However, despite the efficacy of the existing technology, PSNH, with an eye to the future and with knowledge of the successful studies conducted at Indian Point, implemented a pilot study to determine the feasibility of wider-slot wedgewire screens in the Merrimack River.

PSNH notified EPA in an April 12, 2017 letter that the Company was preparing to perform an entrainment-related analysis at Merrimack Station.[575] In the letter, PSNH acknowledged it was not obligated to complete any such analysis unless EPA specifically requested such work (which it had not).[576] Nevertheless, PSNH prepared and submitted to EPA for its consideration a Study Plan detailing the entrainment-related analysis.[577] PSNH respectfully requested EPA timely notify the Company of any objections and/or issues the agency had with any aspect of the Plan.[578] The agency never responded to PSNH's correspondence. PSNH interpreted EPA's inaction as acceptance of PSNH's entrainment initiative, which is confirmed in the Statement: "[T]he Agency welcomes submission of the [on-site pilot testing] data by PSNH as soon as it becomes available."[579]

The Study Plan was jointly executed by PSNH's consultants, Enercon and Normandeau, and, as explained below, revealed wedgewire screens are technologically feasible at Merrimack

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[575] *See generally* AR-1357.

[576] *Id.* at 4.

[577] *See* AR-1361.

[578] AR-1357 at 3.

[579] AR-1534 at 20.

Station and reduce overall entrainment by 89%, compared to current operations at the facility.[580] The installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station operated annually from April through July would therefore substantially reduce the already *de minimis* level of entrainment at the Station at a greatly reduced cost as compared to CCC.[581]

1. Wedgewire Screens Would Reduce Environmental Impacts

EPA acknowledges in its Statement that wedgewire screens:

> [C]an be implemented in the Hooksett Pool section of the Merrimack River, and that this technology may be more effective at reducing the Facility's entrainment than previously thought . . . . In particular, a newly proposed screen design variation (*i.e.*, "wedgewire half-screens") would result in a smaller installation without excessive interference with public uses of the river. . . . Furthermore, additional data has been submitted suggesting that adequate sweeping flows are likely to exist during the time period when the majority of eggs and larvae are present.[582]

PSNH agrees. The Study Plan Enercon and Normandeau carried out this year during the peak entrainment period at the facility confirms EPA's above-referenced statements. Specifically, the study validated that wedgewire screens can be installed and successfully operated at Merrimack Station and, as mentioned above, demonstrated that the 3.0 mm slot width wedgewire screens result in an estimated overall entrainment reduction of 89% compared to current CWIS operations at the facility.[583] Normandeau's 2017 report submitted contemporaneously with these comments provides the detailed results of entrainment reductions from the Study Plan, including a breakdown of the species entrained, entrainment densities, evaluations of the entrainment

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[580] *See, e.g.,* Normandeau 2017 Response at 26-27.

[581] Seasonal operation of the wedgewire screens would also have the co-benefit of further reducing already *de minimis* impingement levels at Merrimack Station because the design through-screen velocity of the screens is less than 0.5 fps. *See, e.g.,* Enercon 2017 Comments at 32.

[582] AR-1534 at 18.

[583] *See, e.g.*, Normandeau 2017 Response at 26-27.

reductions by life stage and taxon group, and analyses of the frequencies and densities of aquatic organisms entrained based on length;[584] whereas Enercon's 2017 report submitted contemporaneously with these comments explains in detail the proposed design, procurement, construction, and installation of the wedgewire screens, including the ideal number, orientation, and location of the screens in the waterbody, as well as the costs and timing associated with the installation of the technology.[585]

Analyses from Normandeau and Enercon ultimately confirmed use of the wedgewire half-screens with larger diameters yields significant reductions in entrainment and are well-suited for the Merrimack River due to its relatively shallow depths in the vicinity of the plant. Also, utilization of larger diameter screens reduces the number of screens required and avoids potential interference with public uses of the waterbody.[586]

2. PSNH Confirmed 3.0 mm Wedgewire Screens Operated Annually in April through July Would be Suitable for Merrimack Station

PSNH and its consultants have previously explained why 3.0 mm slot size screens are well-suited for Merrimack Station.[587] Specifically, wedgewire screens with this slot width: (1) are beneficial from a maintenance and operational standpoint because they help reduce fouling and debris accumulation issues; (2) require fewer screens to be installed while allowing the system to operate with a desired through-screen velocity of less than 0.5 fps; and (3) are capable of reducing entrainment not only through physical exclusion but also through hydraulic bypass and behavioral avoidance. Each of these factors is discussed below.

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[584] *See generally* Normandeau 2017 Wedgewire Report. This report also includes the results of a site-specific current velocity study to quantify the speed of the current, as well as the direction of it. *See id.* at 14-15.

[585] *See generally* Enercon 2017 Comments.

[586] Enercon 2017 Comments at 66.

[587] *See, e.g.*, AR-1352, Attachment 1.

Concerns regarding biofouling and clogging associated with wedgewire screens are not unique to Merrimack Station. EPA and EPRI have expressed industry-wide concerns regarding biofouling issues with systems with small slot-widths. Specifically, in its Technical Development Document that accompanied the 2006 Effluent Guidelines Program Plan, EPA provided:

> The Agency is not aware of any fine-mesh wedgewire screens that have been installed at power plants with high intake flows (>100 MGD). However, they have been used at some power plants with lower intake flow requirements (25-50 MGD) that would be comparable to a large power plant with a closed-cycle cooling system. With the exception of Logan, the Agency has not identified any full-scale performance data for these systems. <u>They would be even more susceptible to clogging than wide-mesh wedgewire screens (especially in marine environments)</u>. It is unclear whether this simply would necessitate more intensive maintenance or preclude their day-to-day use at many sites. Their successful application at Logan and Cope and the historic test data from Florida, Maryland, and Delaware at least suggests promise for addressing both fish impingement and entrainment of eggs and larvae. However, based on the fine-mesh screen experience at Big Bend Units 3 and 4, it is clear that <u>frequent maintenance would be required</u>.[588]

EPRI has also noted these issues:

> Several full-scale CWIS applications of cylindrical wedge-wire continue to perform satisfactorily. However, these applications employ coarse bar spacings (10 mm). Therefore, other than the existence of encouraging data from small-scale laboratory and pilot field facilities, there is still little information on the use for this technology for protecting early life stages. The potential use of 0.5- to 2.0-mm bar spacing to protect early life stages of fish (particularly eggs and early larvae) has not been evaluated at a CWIS. Therefore, larger-scale pilot studies are needed to identify the full biological potential of these screens. Also, <u>there is a need for further research into biofouling control before the potential applicability of wedge-wire screens can be fully assessed. Biofouling, particularly on internal surfaces that are not readily accessible, remains a concern with both large and small slot sizes.</u>

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[588] AR-644 at 5-7 (emphasis added).

Results of small-scale field studies conducted primarily in the 1970's and 1980's have shown that substantial fouling can occur over time in all types of water.[589]

When debris accumulates or organisms colonize on numerous functional parts of wedgewire systems, the passage of cooling water flow is impeded and operation of the intake screening equipment itself may be interrupted. Some mesh openings actually become blocked, thereby restricting the flow of water through the screen and increasing the velocity through the unblocked portions of the screen. Less open screen area also results in a higher pressure drop through the screens, which can impair the performance of a facility's circulating water pumps and reduce fish protection by increasing the through-screen intake velocity.[590]

The slot-width of the wedgewire screens is a key variable in the potential risk of biofouling at a facility. This is so because biofouling organisms first attach to a solid piece of screen and, as the organisms grow, the thickness of the biolayer decreases the open portion of the screen. A screen with a greater percentage of solid wire (*i.e.*, one with smaller percent open area) thus will provide space for a greater number of organisms to attach themselves, meaning the resulting biolayer will obstruct the open area of the screen at a faster rate.[591] Biofouling organisms can also bridge the gap between solid portions of the screen to block flow completely. 3.0 mm slot width wedgewire screens alleviate many of these fouling and debris accumulation issues, and these issues would be further minimized by construction of the system with the

[589] AR-1399 at 66.

[590] *See* Enercon 2017 Comments.

[591] *See* A.Y. Fedorenko, *Guidelines for Minimizing Entrainment and Impingement of Aquatic Organisms at Marine Intakes in British Columbia*, CANADIAN MANUSCRIPT REPORT OF FISHERIES AND AQUATIC SCIENCES, 54 (1991). This manuscript is attached hereto as Exhibit 20.

proposed air burst system[592] and construction of the screen mesh with a Z-alloy that is proven to substantially reduce biofouling compared to stainless steel screens.[593]

As to the number of screens to be installed, EPA provides in its Statement that one of the primary reasons the agency previously rejected the use of wedgewire screen technologies at Merrimack Station is because:

> PSNH's proposed design to serve Merrimack Station's cooling water intake structures, while accommodating the potential limitations of the physical setting (e.g., water depth, current, rate of sediment deposition), would require so many screens and would occupy such a large area of the river, that it would excessively interfere with public uses of the waterway . . . . In its 2007 report responding to an EPA request for information, AR-6, PSNH's consultant Enercon estimated that 24 to 36 [cylindrical wedgewire ("CWW")] screens 5 feet in length and 3 feet in diameter would be required. In its 2009 report providing a supplemental response to EPA's request for information, AR-4, Enercon estimated that 44 to 76 CWW screens 80 inches in length and 2 feet in diameter would be required. The ranges in the number of CWW screens reflect differences in slot size.[594]

These issues are alleviated through the use of 96-inch, 3.0 mm slot-width wedgewire half-screens, as Enercon has determined only seven of these screens would be necessary for the facility.[595] And, because the screens extend approximately four feet from the river bottom, they will not interfere with public recreation in the Merrimack River.[596] Furthermore, the use of 3.0 mm screens means a desirable through-screen velocity of less than 0.5 fps can be maintained; as Enercon discovered during the design phase that installing wedgewire screens with a higher through-screen velocity would result in "an unacceptably high head loss (i.e., energy loss due to

[592] *See, e.g.*, Enercon 2017 Comments at 21. The proposed air burst system "uses periodic bursts of compressed air to blow accumulated objects from the screens, preventing blockage that can lead to higher capture velocities and pressure drops." *Id.*

[593] AR-1352, Attachment 1 at 10; Enercon 2017 Comments at 52-53, 63.

[594] AR-1534 at 17, 17 n.3.

[595] *See, e.g.,* Enercon 2017 Comments at 66.

[596] *See id.*

friction) through the screens . . . [that] would result in reduced water level within the intake bays, potentially causing cavitation and damage to the circulating water pumps."[597]

Entrainment reductions at Merrimack Station from not only physical exclusion but also hydraulic bypass and behavioral avoidance are optimal with 3.0 mm wedgewire screens, as well. Hydraulic bypass occurs when the wedgewire screens are perpendicularly aligned to the prevailing current in the waterbody and the strength of these natural currents cause organisms to be swept past the screens instead of passing through them. It occurs when the ratio of sweeping flow velocity to through-slot flow velocity of the wedgewire screens is 1:1 or greater. The higher the ratio, the more likely inertia carries otherwise entrainable organisms past wedgewire screens without issue.

Normandeau and Enercon confirmed that a constant and high sweeping flow velocity was present in April through July.[598] The wedgewire screens proposed for Merrimack Station would have a through-screen velocity of 0.4 fps;[599] and, the average observed sweeping flow in the Merrimack River was 2.9 fps during field operations conducted during the peak entrainment period in 2009 and 2012.[600] This results in a ratio of sweeping velocity to the through-slot velocity of the screens of approximately 7:1.[601] The sweeping flows observed during execution of the 2017 Study Plan were 1.0 fps or greater for almost the entirety of the test, resulting in a ratio of 2:1 or greater.[602]

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[597] AR-1352, Attachment 1 at 10.

[598] *See* Enercon 2017 Comments at 9-10; Normandeau 2017 Wedgewire Report at 14.

[599] *See* Enercon 2017 Comments at 9-10.

[600] *Id.* at 9.

[601] *Id.*

[602] *Id.* at 10.

Reductions in entrainment due to larval avoidance are unique to wedgewire screen technologies and occur because the screens have a relatively small "zone of hydraulic influence." The scope of this zone varies depending upon the length of the screen, the through-slot velocity, and the sweeping flow, coupled with the premise that fish larva are capable of swimming fast in short bursts. The zone of hydraulic influence has an inverse relationship with sweeping flow, meaning as the sweeping flow increases, the zone of hydraulic influence will decrease. Given the small size of the zone of hydraulic influence for wedgewire screens, a single short and fast swimming burst is all fish larva often need to escape this zone and avoid becoming entrained. Larval avoidance is optimized by correctly aligning the slot openings of the screens relative to the sweeping flow direction.

Normandeau provided the following discussion of laboratory and field analyses for the primary exclusionary methods expected to occur in the Merrimack River following installation of the wedgewire screens:

> Applied research in both a laboratory flume and in the Hudson River estuary using test CWW screens demonstrated that the entrainment reduction performance of CWW screens is related to three factors: physical exclusion by the slot width of passive eggs and larvae, behavioral avoidance of the intake flow by the actively swimming larvae, and the hydraulic bypass of eggs and larvae due to sweeping flow of river currents along the surface of the wedgewire screen when they are installed so the river flow is in a direction perpendicular to the slot openings (i.e., parallel to the slot width). CWW screens (12 inch and 18 inch diameter) with slot widths of 2, 3, 6, and 9 mm were tested in a large hydraulic flume using approximately 450,000 fish larvae (including 207,000 White Sucker larvae) and an equal number of neutrally buoyant 1 mm diameter beads (representing fish eggs) at flume velocities of 0.25, 0.50, 1.0, 1.5, and 2.0 feet per second (fps), with through-slot velocities of 0.25 and 0.50 fps, for a total of 24 combinations of slot width, flume velocity, and through-slot velocity among 4,647 individual tests. Physical exclusion was observed to reduce entrainment in a direct relation to limiting dimensions of the test subjects, particularly passive test subjects like beads (eggs) and

anesthetized larvae. Fish eggs, larvae, or juveniles with a greatest body depth larger than the slot width were physically excluded and not entrained. Behavioral avoidance was observed to be higher for the two smaller slot widths (2 mm and 3 mm) and for a lower through-slot velocity. Overall, avoidance and hydraulic bypass were higher at higher ratios of sweeping velocity to through-slot velocity, with typically 80% or more of the larvae 12 mm in total length or larger capable of actively swimming to avoid entrainment at a ratio of sweeping velocity to slot velocity greater than 1:1 (Mattson et al. 2011, 2014, and 2015). These mechanistic flume studies demonstrated that hydraulic bypass and avoidance were the prevailing modes of the entrainment reduction effectiveness for CWW screens if installed with the river flow perpendicular to the slot width and a sweeping velocity to slot velocity of 1:1 or greater (Mattson et al. 2011).

Field testing of a CWW screen conducted during the 2011 entrainment season in the Hudson River estuary at Indian Point confirmed the entrainment reduction performance observations from the laboratory flume tests. Entrainment sampling was performed at Indian Point *in situ* for 96 continuous hours each week for 24 consecutive weeks from mid-April through mid-September 2011 (Mattson et al. 2014 and 2015). A total of 1,104 pairs of two-hour pumped samples (100 m^3 each) were collected from a 2 mm slot width CWW test screen with a 0.25 fps through-slot velocity deployed 35 feet below the water surface and paired with control samples from coincident 1 m^2 Tucker trawl tows (300 m^3 each) deployed at 35 feet of depth and into the prevailing current immediately upstream from the test CWW screen. A total of 31 ichthyoplankton taxa and 275,245 individuals (83% post yolk-sac larvae) were collected and analyzed from these pairs of Hudson River samples filtered through a 300 micron mesh net. Larval avoidance of the test screen was observed to increase with increasing larval length for the most abundant species (striped bass, 35%; and Bay Anchovy, 28%) as predicted in the flume, and the overall entrainment reduction for 2 mm CWW screens at Indian Point was estimated to be 78% (Mattson et al. 2015).[603]

Lastly, the appropriate time period to operate the wedgewire screen technologies annually at Merrimack Station would be April through July because the overwhelming majority of entrainment occurs at the facility during this time period and because fouling of the screens in

[603] AR-1352, Attachment 1 of Attachment 1 at 1-2.

other months of the year becomes a potential concern due to traditionally low river flow. Specifically, Normandeau's 2006 and 2007 biological data indicates that the greatest entrainment potential at Merrimack Station typically occurs between late May and late June[604] and Normandeau recently provided that 96.3 percent of total annual entrainment at the facility occurs in April through July.[605]

In its Statement, EPA repeatedly references its belief and conclusion from the 2011 Draft Permit Fact Sheet that entrainment needs to be addressed annually in August "based on the biological data."[606] Yet, a review of that Fact Sheet does not support this assertion and, in fact, reveals EPA actually acknowledges multiple times that entrainment "taper[s] off" in August.[607] A cursory review of Table 11-4 in that Fact Sheet corroborates this fact.[608] EPA instead appears to couch its conclusion that entrainment controls in August are necessary because Merrimack Station's flow withdrawal rates, as a percentage of available river flow, are on average slightly higher than the preceding months.[609] This argument fails, however, when one takes into consideration that few, if any, entrainable organisms are present in the waterbody segment—a fact that is corroborated by a detailed review of Normandeau's data and corresponding conclusions.[610] In actual fact, EPA has failed to put forth any concrete and/or detailed analyses

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[604] AR-2 at 41.

[605] Normandeau 2017 Response at 27.

[606] *See, e.g.,* AR-1534 at 12-13.

[607] *See, e.g.,* AR-618 at 251.

[608] *Id.* at 249-50.

[609] *See, e.g., id.* at 254.

[610] In fact, this increased withdrawal percentage reflects the reality that flows in the Merrimack River typically begin to decrease in August and continue to decrease through November. Given the number of entrainable organisms present in the waterbody in August is negligible, these decreased flows actually further support a conclusion that the wedgewire screens should not be operated during this time because of the increased likelihood that debris could interfere with, damage, and/or clog the screens. Enercon addresses this issue:

as to why entrainment controls are necessary at Merrimack Station in August. Accordingly, its conclusions are arbitrary and capricious and must be replaced with Normandeau's well-reasoned and scientifically defensible conclusions that entrainment controls are necessary at the facility only in April through July.

3. Wedgewire Screens are Far More Cost Effective Than CCC

The costs and relative benefits associated with any CWIS technology must be considered in rendering a BTA determination pursuant to § 316(b). The limited legislative history of § 316(b) makes this clear. Specifically, that legislative history provides that BTA should be interpreted to mean "best technology available commercially <u>at an economically practicable cost</u>."[611] Since at least 1977, EPA has compared costs and benefits in making BTA

> The primary reason for operating the site with wedgewire screens during part of the year is to limit unnecessary exposure of the screens to potentially damaging objects. The current design for the screens recommends the placement of bollards around the screens when they are not in use to reduce the risk of damage from objects (e.g., submerged tree limbs, refuse, other waterborne debris, etc.) that are travelling downstream on the river currents. Submerged debris can collide with the screens, damaging and altering the form of the screen and/or hampering the ability of the screen to operate properly. An alteration to the shape of the screen could decrease the velocity ratio, decrease the hydraulic bypass, and/or alter the slot size of individual slots. Any of these alterations would decrease the effectiveness of the screens' ability to reduce entrainment.
>
> While the screens are not in operation, bollards placed around the screens would keep them protected from river borne objects. The Station would employ divers to remove the protective bollards and perform inspections/repairs prior to the season of operation. Removal of the bollards helps to maintain the hydraulic flow around the screens while they are in operation. The screens would then be placed into operation during the peak entrainment season. At the end of the operation season, divers would return the protective bollards to the screens and the intake bypass system would be employed, effectively removing the screens from operation.
>
> Operation of the screens is recommended from April 1st to July 31st to provide an effective reduction in entrainment while limiting the unnecessary exposure of the screens to potentially damaging objects. The remaining months of the year when entrainment is at a minimum, the screens would be inoperative and protected . . . to minimize risk of damage to the screens.

Enercon 2017 Comments at 67-68.

[611] *See* Legislative History of the Water Pollution Control Act Amendments of 1972, 93rd Cong., 1st Sess., 264 (1973) (emphasis added). Hereinafter, references to this document will be cited as "WPCA 1972 Legislative History."

determinations to minimize AEI pursuant to § 316(b).[612] In *Seabrook*, the EAB noted that "consideration ought to be given to costs in determining the degree of minimization" required under § 316(b) and supported this assertion by providing that if costs and relative benefits were not to be considered in such technological analyses, cooling towers would be required "at every plant that could afford to install them, regardless of whether or not any significant degree of entrainment or [impingement] was anticipated."[613] This is not the case. Thus, the Board concluded that it is not "reasonable to interpret Section 316(b) as requiring technology whose cost is <u>wholly disproportionate</u> to the environmental benefit gained."[614]

EPA embraced this "wholly disproportionate" standard in conducting cost-benefit analyses—and consistently rejected CCC as too costly and unjustified in light of the potential environmental benefits—under § 316(b) until it issued a proposed rule for CWISs at Phase II existing facilities in 2002.[615] Specifically, in that rule proposal, EPA developed a "significantly greater" standard for measuring costs versus relative benefits and provided the following justification for doing so:

> [T]he new facility rule required costs to be "wholly disproportionate" to the costs EPA considered when establishing the requirement at issue rather than "significantly greater" as proposed today. EPA's record for the Phase I rule shows that

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[612] *See In the Matter of Pub. Serv. Co. of N.H. (Seabrook Station Units 1 and 2)*, NPDES Appeal No. 76-7, 1977 WL 22370, at *7 (EAB June 10, 1977), *aff'd after remand*, *Seacoast Anti-Pollution League v. Costle*, 597 F.2d 306 (1st Cir. 1979).

[613] *Id.*

[614] *Id.* (emphasis added); *see also In re Cent. Hudson Gas & Elec. Corp.*, Op. EPA Gen. Counsel No. 63, 1977 WL 28250, at *8 (OGC July 29, 1977) (citing the *Seabrook* Board's "wholly disproportionate" standard with approval and providing that minimization of AEI required under § 316(b) "must be tempered by economic considerations."). "EPA ultimately must demonstrate that the present value of the cumulative annual cost of modifications to [CWISs] is not wholly out of proportion to the magnitude of the estimated environmental gains." *Id.* at *7; *see also In the Matter of Pub. Serv. Co. of N.H.(Seabrook Station, Units 1 and 2)*, NPDES Appeal No. 76-7, 1978 WL 21140, at *20 (EAB Aug. 4, 1978) (refusing to require the permittee to move its intake structure further offshore beyond the presently proposed site because to do so would be "wholly disproportionate to any environmental benefit"), *aff'd*, *Seacoast*, 597 F.2d at 311.

[615] *See* 67 Fed. Reg. 17,121 (April 9, 2002) (codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125).

> those facilities could technically achieve and economically afford the requirements of the Phase I rule. New facilities have greater flexibility than existing facilities in selecting the location of their intakes and technologies for minimizing adverse environmental impact so as to avoid potentially high costs. Therefore, EPA believes it appropriate to push new facilities to a more stringent economic standard. Additionally, looking at the question in terms of its national effects on the economy, EPA notes that in contrast to the Phase I rule, this rule would affect facilities responsible for a significant portion (about 55 percent) of existing electric generating capacity, whereas the new facility rule only affects a small portion of electric generating capacity projected to be available in the future (about 5 percent). EPA believes it is appropriate to set a lower cost threshold in this rule to avoid economically impracticable impacts on energy prices, production costs, and energy production that could occur if large numbers of Phase II existing facilities incurred costs that are more than significantly greater than but not wholly disproportionate to the costs in EPA's record.[616]

In short, EPA chose the "significantly greater" standard (instead of the "wholly disproportionate" test) to signal its understanding that existing facilities have less flexibility in selecting locations and technologies, that the rule will affect a much larger portion of the generating capacity, and that a less extreme standard will avoid "economically impracticable impacts on energy prices[.]"[617]

EPA's use of the "significantly greater" standard in its 2004 Phase II rule and its established practice of considering costs and relative benefits in making § 316(b) BTA determinations was challenged and eventually heard by the U.S. Supreme Court. Specifically, in *Entergy*,[618] the U.S. Supreme Court definitively confirmed that § 316(b) allows the permit writer to consider costs and benefits in determining BTA to minimize AEI. Although the Supreme Court ultimately left it to EPA's discretion to decide how to take into account costs and benefits

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616 *Id.* at 17,145-46 (emphasis added).

617 *See* 68 Fed. Reg. 13,521, 13,541 (Mar. 19, 2003) (codified at 40 C.F.R. pt. 125).

618 556 U.S.at 226.

in § 316(b) actions, it made clear that such considerations are acceptable. Specifically, the Supreme Court provided that:

> "[B]est technology" may . . . describe the technology that *most efficiently* produces some good. In common parlance one could certainly use the phrase "best technology" to refer to that which produces a good at the lowest per-unit cost, even if it produces a lesser quantity of that good than other available technologies.[619]

As additional support, the Supreme Court provided that the term "minimize," as used in § 316(b), "admits of degree and is not necessarily used to refer exclusively to the 'greatest possible reduction.'"[620] The Supreme Court also recognized EPA's prior use of the term "wholly disproportionate" compared to its use of "significantly greater" in the rule at issue, and stated that although the standards may be somewhat different, "there is nothing in the statute that would indicate that the former is a permissible interpretation while the latter is not."[621] Thus, the Supreme Court concluded, use of either the "significantly greater" or more rigorous "wholly disproportionate" tests are both acceptable for considering the costs and relative benefits for § 316(b) BTA determinations at existing facilities.[622]

EPA enjoys some latitude on what constitutes a ratio of costs that are not "significantly greater than" or "wholly disproportionate" to the relative benefits of a given technology. However, its discretion is not unfettered. In the past 40+ years of rulemaking by the agency, coupled with occasional statements throughout this time frame that explicitly address this issue, a threshold or ceiling of cost-benefit ratios has been established. For instance, in 1991, EPA

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[619] *Id.* at 218.

[620] *Id* at 219.

[621] *Id.* at 225.

[622] *Id.*; *see also Voices of the Wetlands v. State Water Res. Control Bd.*, 257 P.3d 81, 104-06 (Cal. 2011) (upholding a permit writer's use of the wholly disproportionate cost-benefit analysis instead of the 2004 Phase II regulation's "significantly greater" test in assessing § 316(b) BTA determinations and providing that *Entergy* makes clear that the "wholly disproportionate" test is more stringent than the significantly greater test employed in EPA's 2004 § 316(b) rule).

Region 4 generated a document entitled "Some Specific Comments on CWA § 316(b) Issues," in which it stated that:

> [T]here are no published EPA guidelines relating to what constitutes wholly disproportionate; however, a factor of 10 or more may be a reasonable factor to be used. That is, expenditures of perhaps 10 times the annual environmental damage might be a reasonable basis for evaluation.[623]

This document plainly establishes a recommended ratio of around 10 to 1 as the threshold for determining whether costs are wholly disproportionate to benefits.[624]

The quantifiable costs and relative benefits of EPA's final § 316(b) rule have a ratio of 8.25 to 1 and/or 10.29 to 1, utilizing a 3 percent and 7 percent discount rate, respectively, and this does not include the costs associated with technologies that may be necessary to address entrainment:[625]

> The cost of additional technologies that may be required to meet the site-specific BTA for entrainment are not included in this analysis because . . . EPA cannot estimate, with any level of certainty, what site-specific determinations will be made based on the analyses that will be generated as a result of the national BTA standard for entrainment decision-making established by [the final rule].[626]

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[623] AR-671 at IV-52.

[624] This ratio is consistent with the Department of Interior's determination of the point at which restoration costs would be considered "grossly disproportionate" and therefore not recoverable as natural resource damages. *See* 61 Fed. Reg. 20,560, 20,602 (May 7, 1996) (codified 43 C.F.R. pt. 11). However, numerous courts have found more proportional cost-benefit ratios necessary to satisfy analogous standards in other contexts. *See, e.g., State of Ohio v. U.S. Dep't of the Interior*, 880 F.2d 432, 443, n. 7 (D.C. Cir. 1989), *reh. denied en banc*, 897 F.2d 1151 (1989), (providing, in dictum, that "grossly disproportionate" could mean damages three times the amount of use value); *Gen. Ry. Signal Co. v. Wash. Metro. Area Transit Auth.*, 875 F.2d 320, 326 (D.C. Cir. 1989), *cert. denied*, 494 U.S. 1056 (1990) (concluding that a cost-benefit ratio of 2.3-to-1 or less is reasonable); *see also* 69 Fed. Reg. 41,575, 41,662, 41,666 (July 9, 2004) (codified at 40 C.F.R. pts. 9, 122, 123, 124, and 125) (rejecting CCC with a cost-benefit ratio of 42 to 1 as BTA in EPA's 2004 rule for Phase II existing facilities and instead adopting compliance alternatives with a ratio of approximately 4.5 to 1).

[625] *See* 79 Fed. Reg. at 48,303-04.

[626] *Id.* at 48,304.

EPA notably referenced the *Entergy* opinion in its final § 316(b) rule to support the agency's proposition that when setting national performance standards for CWISs under 316(b), the permitting agency should compare the costs and benefits of various technologies.[627] Furthermore, there is nothing in the final § 316(b) rule to suggest the "significantly greater" and/or "wholly disproportionate" cost-benefit standards were revoked or superseded by language in the agency's 2014 rulemaking. Accordingly, these cost-benefit standards remain in effect and must govern EPA's BTA decision-making process.

PSNH's consultant, NERA, assessed the costs and relative benefits of wedgewire screen technologies in a 2012 report[628] submitted to EPA in response to its 2011 Draft Permit and has completed a revised assessment in its 2017 report submitted to the agency contemporaneously with these comments.[629] NERA's report was completed in accordance with the tenets of the final § 316(b) rule[630] and adheres to the principles set out in EPA's Guidelines for Preparing Economic Analyses.[631] In other words, the latest social benefits and costs analysis by NERA "is of sufficient rigor"[632] and must therefore be considered by EPA in rendering its BTA determination for entrainment. Utilizing existing CWIS operations at the Merrimack Station as the baseline, NERA concludes that the cost-benefit ratio for the installation of wedgewire screens at the facility is 192 to 1 and 295 to 1 in 2017 dollars, utilizing discount rates of three and seven

[627] *See id.* at 48,313, 48,318, 48,351.

[628] *See* AR-1199.

[629] *See generally* NERA 2017 Report.

[630] *See* 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11).

[631] EPA, Guidelines for Preparing Economic Analyses (Dec. 17, 2010), available at https://yosemite.epa.gov/ee/epa/eerm.nsf/vwAN/EE-0568-50.pdf/$file/EE-0568-50.pdf. Hereinafter, references to this document will be cited as "EPA Guidelines for Preparing Economic Analyses."

[632] 40 C.F.R. § 125.98(f)(2)(v).

percent, respectively.[633] Stated plainly, this means that for every dollar of benefit generated by the installation of wedgewire screens, $192 or $295 would have to be paid in costs to install and operate the technology. These ratios grossly fail EPA's "wholly disproportionate" and/or "significantly greater" cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations.[634] Accordingly, EPA cannot reasonably classify wedgewire screens as BTA for entrainment at Merrimack Station. Notwithstanding their inability to satisfy EPA's cost-benefit standards, PSNH has shown through its pilot study that installation of 3.0 mm wedgewire screens with a designed through-screen velocity of less than 0.5 fps at Merrimack Station, operated annually from April through July, is highly effective at reducing entrainment at substantially less cost as compared to CCC.[635]

4. An Emergency Bypass for Wedgewire Screens Is Imperative and Consistent With Sound Engineering Practices

EPA specifically seeks comments regarding the use of an emergency bypass mechanism for the wedgewire screen technologies considered for Merrimack Station.[636] Installation and operation of this emergency bypass mechanism is essential to allow the facility to adequately avert potentially catastrophic issues in the event of a significant blockage or damage to the wedgewire screens. A bypass feature of this kind is consistent with sound engineering practices and, when put in use, would protect and prevent harm to valuable infrastructure at the facility by

[633] *See, e.g.,* NERA 2017 Report at E-4.

[634] *See* 79 Fed. Reg. at 48,303-04; AR-671 at 52.

[635] Enercon explains in its 2017 comments that the non-water quality and other environmental impacts associated with wedgewire screens are miniscule compared to those associated with CCC, which are discussed in detail below. *See* 40 C.F.R. §§ 122.21(r)(12); 125.98(f)(2), (3). The only anticipated parasitic load associated with the screens is the operation of the air burst system compressors, which Enercon estimates would require approximately 172 MW-hr per year. Enercon 2017 Comments at 7. And, unlike CCC technologies, there are no water consumption and land availability issues, anticipated increases in air emissions, or icing/fogging concerns associated with operation of wedgewire screens at Merrimack Station. *See, e.g., id.* at 12-16.

[636] AR-1534 at 20-22.

providing the necessary flow of water to cool plant processes, which sustains on-line operations and reduces risks of large equipment thermal transients, incremental wear and damage, and other adverse conditions. Conversely, eliminating the bypass feature would result in added direct costs and reduced reliability at Merrimack Station—both of which negatively impact customer benefits—because the aforementioned conditions would occur more frequently than if a bypass feature were installed for the wedgewire screen technology.

The bypass system is primarily needed to ensure that a continuous supply of cooling water is always available to Merrimack Station. Were the wedgewire screens to become partially or completely blocked, a reduction in the water level within the screen houses would occur. At a certain point, the pumps would become damaged due to air intrusion, pressure differentials, and vortex formation unless the pumps were tripped. A tripping of the pumps means operations at Merrimack Station would likewise be tripped. This would result in lost generating capacity for the Station and loss of cooling to equipment within the plant. Installation of a bypass system ensures operational reliability at the facility by guaranteeing a continuous supply of cooling water would be available. This helps maintain power generation, but is also critical for maintaining the safety and reliability of plant equipment.

EPA discusses the bypass feature as a means for PSNH to operate the wedgewire screen technologies annually during the month of August to address entrainment. PSNH maintains that entrainment at Merrimack Station is *de minimis* and, even if EPA disagrees with this *de minimis* conclusion, that entrainment controls during the month of August are not necessary because ichthyoplankton are not common in the Hooksett Pool in August.[637] As stated above, the foundation for EPA's belief that entrainment controls in August are necessary is due to

[637] *See, e.g.,* AR-1170 at 126.

Merrimack Station's comparatively larger flow withdrawal rates, as a percentage of available river flow.[638] However, when the negligible quantity of entrainable organisms present in the waterbody in August is taken into consideration, this comparatively larger flow withdrawal rate actually undercuts EPA's premise. The reason Merrimack Station's relative withdrawal rates have historically increased in August is because overall flows in the Merrimack River typically begin to diminish and continue to decrease through November. Overall lower flows within the waterbody mean there's an increased likelihood that debris (e.g., submerged tree limbs, refuse, etc.) could interfere with, damage, and/or clog the wedgewire screens. Enercon provides that operating the wedgewire screens in August or at any time other than April through July unnecessarily exposes the screens to damaging objects that could impair and/or alter the shape of the screens, which could ultimately "decrease the effectiveness of the screens' ability to reduce entrainment."[639] For these reasons, Enercon has proposed placing bollards around the screens when they are not in use to protect them and minimize the risk of damage due to objects traveling downstream.[640]

In the end, the installation and use of bypass gates associated with wedgewire screens is consistent with sound engineering practices. The gates serve an imperative emergency function of preventing catastrophic damage to critical infrastructure at the facility. They should not, however, be relied upon by EPA as a basis to justify requiring entrainment control technologies annually in August or during any period other than April through July. The studies and biological data in the administrative record make clear that entrainment at Merrimack Station is *de minimis*. Even if EPA disagrees, operation of entrainment control technologies in August is

[638] *See, e.g.,* AR-618 at 254.

[639] *See* Enercon 2017 Comments at 67-68.

[640] *See id.* at 68.

not necessary because there are few entrainable organisms present in the waterbody and because use of the technologies during this lower run-of-river flow period unnecessarily subjects the infrastructure to an increase of damage or destruction due to waterborne debris.

E. CCC Is Not BTA for Merrimack Station

In its 2011 Draft Permit, EPA utilized its BPJ to require extreme measures as BTA for the CWISs at Merrimack Station. EPA sought to require PSNH to, among other things, limit the intake flow volume of both CWISs at Merrimack Station to a level consistent with operating in CCC mode from, at a minimum, April 1 through August 31 of each year. PSNH and other interested stakeholders disputed these determinations as arbitrary and capricious in their February 2012 comments to the Draft Permit.

Since that time, CCC was rejected as BTA for CWISs in EPA's final § 316(b) rule. Instead, the final rule provides broad flexibility to facilities to comply with the CWA 316(b) BTA standard, including seven pre-approved control technologies from which a facility may choose to satisfy the impingement BTA standard, as well as a *de minimis* exception that requires no additional controls because the rate of impingement at the facility is low. For entrainment, BTA is to be decided on a site-specific basis and also includes a possible determination that no entrainment controls at a facility are necessary.

PSNH went to great lengths in its 2012 comments to explain why EPA's § 316(b) BTA determination requiring the installation of CCC at Merrimack Station was arbitrary, capricious, and contrary to law. PSNH reasserts many of the same arguments below, with updates to account for changes in factual and regulatory circumstances that have occurred in the intervening five years.

1. CCC Is Not an Available Technology at Merrimack Station Because It May Not Be Technologically Feasible and Cannot Be Installed at an Economically Practicable Cost

To be classified as BTA pursuant to CWA § 316(b), a given technological treatment system must be both technologically feasible and economically practicable. The CWA's legislative history makes clear that this BTA standard is to be interpreted to mean "best technology available commercially at an economically practicable cost."[641] EPA has, in turn, interpreted this legislative history to mean "that the application of [BTA] should not impose an impracticable and unbearable economic burden" upon the regulated entity.[642]

PSNH and its consultant, Enercon, explained in numerous reports and submissions to the agency that certain site-specific factors, such as the need for a new pumping station and condenser cleaning system, coupled with logistical issues with existing piping interfaces, limited land availability, site layout constraints, operating parameters, and water treatment and quality issues, all raise serious questions or doubts regarding whether retrofitting CCC at Merrimack Station is technologically feasible.[643] PSNH also explained in its 2012 comments to the 2011 Draft Permit that the outrageous sticker price of CCC means the technology cannot be installed at Merrimack Station at an economically practicable cost. Accordingly, CCC cannot constitute BTA for the facility. Set out below is an updated discussion of the economic impracticability of requiring CCC to be installed at Merrimack Station, along with an examination of the mandatory and suggested factors set out in the final § 316(b) rule that demonstrate why installation of CCC is not technology feasible at the facility.

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[641] *See* WPCA 1972 Legislative History.

[642] *See* 69 Fed. Reg. at 41,604.

[643] *See, e.g.,* AR-6; AR-846; AR-864.

2. The Costs to Install CCC at Merrimack Station Are Wholly Disproportionate, Significantly Greater, or Simply Unreasonable Compared to Expected Environmental Benefits

In 2012, PSNH discussed in its comments to the Draft Permit the comprehensive cost-benefit work of its consultant, NERA, and its conclusions that the cost-benefit ratio for CCC at Merrimack Station would be 974 to 1 and that the incremental costs to the incremental benefits of CCC relative to cylindrical wedgewire screens was an astounding 4,317 to 1.[644] PSNH likewise outlined the myriad deficiencies and inconsistencies in the supposed cost-benefit analysis EPA set out in its 2011 Fact Sheet, including those errors noted by NERA in its analyses.[645] The zenith of these collective critiques is that in assessing costs as a mandatory BTA factor, EPA engaged in nothing more than an affordability determination and the agency repeatedly failed to adhere to its own standards, guidance, and prior precedent in rigorously assessing whether the benefits of CCC compared to relative costs constitutes BTA at Merrimack Station. PSNH and NERA presented clear evidence that installation of CCC as BTA is unwarranted, arbitrary, and capricious.[646]

EPA has never responded to these comments and elected not to do so again in its latest Statement. Moreover, EPA failed to address in its Statement whether the agency believes its only attempted assessment of CWIS costs and relative benefits in the administrative record—the aforementioned affordability determination set out in its 2011 Fact Sheet—satisfies the relevant study requirements set out in 40 CFR Part 122 and/or the "sufficient rigor" standard the agency

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[644] *See* AR-846 at 88-89.

[645] *See id.*

[646] EPA is likewise required to consider the costs associated with achieving an effluent reduction in rendering a legally defensible BAT determination for thermal discharges. *See* 33 U.S.C. § 1314(b)(2)(B) (requiring EPA to consider, among other things, the cost of achieving an effluent reduction in rendering a BAT determination for thermal discharges). The critiques and arguments set out in PSNH's 2012 comments and NERA's 2012 report regarding the lack of rigor in EPA's assessment of the costs of CCC technologies therefore apply equally to EPA's § 316(a) BAT determination for Merrimack Station.

established in its 2014 final § 316(b) rule.[647] Specifically, in making the "[q]uantified and qualitative social benefits and costs of available entrainment technologies" a factor EPA must evaluate in rendering a legally defensible entrainment BTA determination, the agency requires the benefit and cost information to be of sufficient rigor to ensure it is based on sound engineering and science.[648] EPA's 2011 assessment ignored the objective scientific data PSNH and its consultants had previously submitted to the agency that would have provided a reasonable basis for quantitatively assessing anticipated benefits and, instead, relied upon a disjointed patchwork of qualitative benefits analyses that, without question, lacks the requisite "rigor" to be of any value to the agency.

NERA revisited and revised its 2012 cost-benefit ratio in its 2017 report to reflect the requirements and considerations included in EPA's final § 316(b) rule, the agency's updated Guidelines for Preparing Economic Analyses, more detailed preliminary estimates on the costs to install and operate CCC,[649] and benefits information that has likewise been updated to incorporate new available information.[650] NERA's 2017 Report was prepared in accordance with the requirements of the Benefits Valuation Study and cost evaluations-portion of the Comprehensive Technical Feasibility and Cost Evaluation Study EPA describes in the final § 316(b) rule and requires facilities with a 3-year average AIF of 125 MGD or more to submit as part of the NPDES permit application.[651] Moreover, no one could reasonably contend NERA's report lacks the "sufficient rigor" required to be utilized by the agency to render a reasoned BTA

[647] *See* 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11); *id.* at § 125.98(f)(2)(v).

[648] *See id.*; *see also* 79 Fed. Reg. at 48,367-68.

[649] Enercon provided much of this preliminary cost data to NERA and cautions that it is generally accepted in the industry that the total costs formulated in the conceptual design stage of a project almost always increase dramatically in the subsequent stages of the project. *See* Enercon 2017 Comments at 13-14.

[650] *See* NERA 2017 Report.

[651] 40 C.F.R. §§ 122.21(r)(10)(iii), (r)(11).

determination, as it thoroughly evaluates and quantifies each of the key cost and benefit metrics EPA recommends in the final § 316(b) rule, as well as other industry guidelines.[652] The cumulative effect of this new information is a new cost-benefit ratio for the installation of CCC at Merrimack Station that has dramatically increased. Specifically, NERA concluded **the cost-benefit ratio for CCC is now 1,714 to 1 and 2,333 to 1** in 2017 dollars, utilizing discount rates of three and seven percent, respectively.[653] Thus, for every dollar of benefit generated by the installation of CCC, $1,714 or $2,333 would have to be paid in costs to install and operate the technology.

NERA also assessed the ratio of the incremental costs to the incremental benefits of CCC relative to wedgewire screens. Remarkably, that ratio is an astounding $10,081 to 1 in 2017 dollars utilizing a three percent discount rate, meaning that an additional $10,081 would have to be paid for every $1 of <u>additional</u> benefit provided by CCC compared to wedgewire screens at Merrimack Station.[654] Using a seven percent discount rate, the incremental cost-benefit ratio between wedgewire screens and CCC is $18,499 to 1 in 2017 dollars. Again, that means an additional $18,499 would have to be paid for every $1 of <u>additional</u> benefit provided by CCC compared to wedgewire screens at Merrimack Station.[655]

These ratios woefully fail EPA's "wholly disproportionate" and/or "significantly greater" cost-benefit standards and far exceed the threshold ratios of approximately 8 to 1 and/or 10 to 1 the agency has advanced as the proper metric for rendering § 316(b) BTA determinations.[656]

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[652] *See* 40 C.F.R. § 125.98(f)(2); *see, e.g.*, EPA Guidelines for Preparing Economic Analyses.

[653] *See, e.g.*, NERA 2017 Report at E-4.

[654] *See id.*

[655] *See id.*

[656] *See* 79 Fed. Reg. at 48,303-04; AR-671 at 52.

Accordingly, the agency should not and legally cannot render a BTA determination requiring CCC technologies at Merrimack Station that would withstand judicial scrutiny.

3. CCC Is Not the BTA for Merrimack Station According to Consideration of Other Mandatory Factors Set Out in the Final § 316(b) Rule

The final § 316(b) rule requires or authorizes permit writers to consider an array of non-water quality environmental effects in making an informed BTA determination for a facility, including but not limited to effects on energy reliability, limited land availability, remaining useful plant life, and increased water consumption. EPA mentioned some of these effects in the § 316(a) BAT determination-portion of its 2011 Fact Sheet for the Draft Permit and PSNH made the assumption in its 2012 comments that EPA intended for the same analysis and conclusions to apply to its § 316(b) BTA determination despite the fact that these criterion were not discussed separately or incorporated by reference in the § 316(b) section of the 2011 Fact Sheet.[657] PSNH concluded in its 2012 comments to the Draft Permit that EPA incorrectly surmised that "none of these potential environmental impacts should prevent this option from being selected as the BAT for reducing the facility's thermal discharge to the Merrimack River."[658] PSNH identified this conclusion as "clearly arbitrary and capricious and not supported by the uncontroverted facts and studies available to EPA" and provided a reasoned analysis of the pertinent non-water quality environmental effects that prohibit or substantially complicate the installation of CCC at Merrimack Station.[659] Those comments remain valid today. Set out below is a discussion of

[657] Notably, the following secondary environmental effects delineated in the final § 316(b) rule were not mentioned or adequately considered in EPA's 2011 Fact Sheet and are also lacking from the agency's Statement: "land availability inasmuch as it relates to the feasibility of entrainment technology;" "[r]emaining useful plant life;" and "[q]uantified and qualitative social benefits . . . of available entrainment technologies . . . ." 40 C.F.R. § 125.98(f)(2)(iii)-(v).

[658] *See* AR-846 at 99 (citing AR-618 at 156).

[659] *See id.*

these secondary environmental effects, updated to reflect issues that have arisen in the intervening 5+ years that could further complicate the installation of CCC at the facility.

a. Limited Land Availability at the Plant Makes Installation of CCC Complex if not Impossible

Other than reference the general discussion for a proposed CCC location at Merrimack Station PSNH provided to the agency in response to a 2007 § 308 information request, EPA said nothing in its 2011 Fact Sheet to the Draft Permit to address this non-water quality issue.[660] EPA has failed again in its Statement to discuss this non-water quality issue even though the new final § 316(b) rule requires the agency to consider this issue "as it relates to the feasibility of entrainment technology."[661]

EPA's evaluation of land availability to accommodate CCC is wholly inadequate and is compounded by the fact that PSNH's previous submittal is now obsolete due to the installation of an FGD scrubber system that has taken up a lot of previously available land and created "accessibility" issues for interfacing any additional technologies to the main part of the plant. A 2012 report from Enercon updated the information contained in PSNH's 2007 § 308 Response and raised a number of potential logistical issues that may inhibit CCC installation due to the FGD system, such as the need for a new pumping station and condenser cleaning system, existing piping interfaces, site layout constraints (*i.e.*, limited available space), operating parameters, and water treatment and quality issues.[662] In actuality, additional studies must be

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[660] AR-618 at 140-141 (citing AR-6 at 34-35).

[661] 40 C.F.R. § 125.98(f)(2)(iii).

[662] AR-864 at 42. If forced to install CCC at Merrimack Station, PSNH would ultimately have to consider running the necessary piping along the shoreline and within a narrow strip of land buttressed by railroad tracks that contains highly erodible sands and is within a shoreline protection zone. Obtaining the necessary construction and/or operational permits may be impossible.

conducted before EPA can definitively state that CCC can actually be installed at Merrimack Station.

Accordingly, it is unclear at the present time whether Merrimack Station has the necessary space to physically install CCC at the plant and EPA's failure to adequately address this regulatory factor is and remains arbitrary and capricious.

b. EPA Incorrectly Dismisses as Insignificant the Expected Lost Generation that Will Occur if CCC is Installed at Merrimack Station

EPA noted in its 2011 Fact Sheet that PSNH estimated an approximately 10 megawatt ("MW") reduction in the average, annual electricity output at Merrimack Station if forced to install CCC.[663] Specifically, 2.98 MW of that expected loss would be caused by condenser efficiency losses due to the increased temperature of cooling water provided to it. The remaining 6.7 MW is not lost, per se; instead, it would be needed to power the total booster pumps and tower fans necessary to run CCC at the plant.[664] Despite acknowledging this anticipated reality, EPA ignored the resulting consequence of these expected parasitic power generation losses eliminating enough electricity from the grid to power over 7,900 households.[665] Enercon put these numbers into proper perspective:

> If conversion to closed-cycle cooling became the standard for all power plants in the United States, the generating capacity of the Nation's fleet would be substantially impacted. Assuming all open-cycle power plants in the United States were required to be converted to closed-cycle cooling, it is estimated that approximately 166 million MW-hr per year of generating capacity would be lost . . . This represents enough electricity to power approximately 15.5 million average American households . . . Approximately 40 power generating stations the size of Merrimack

[663] AR-618 at 156-57 (citing to AR-6).

[664] *See* AR-06 at 45; AR-864 at 28.

[665] *See* AR-864 at 28-29.

> Station would have to be built to make up the lost generating capacity.[666]

The retirement of electric generating facilities in recent years only further exacerbates this issue, as removal of this substantial amount of electricity from the grid could dramatically impact the reliability of energy delivery.

In its 2017 report, Enercon suggests EPA initiate a rigorous analysis of how CCC would impact the generating capacity of Merrimack Station.[667] Were EPA to continue to erroneously advance CCC as the proper technology the facility, the agency must first initiate some form of modeling to consider not only the power consumption impacts to Merrimack Station but also the macro effects of setting such a standard within the industry prior to identifying the technology as BTA. The agency's failure to do so in its 2011 Draft Permit and again in its Statement is arbitrary and capricious.

c. Increased Water Consumption Due to CCC at Merrimack Station Will Remove an Alarming Amount of Water from the Hooksett Pool Each Day

EPA summarily dismissed this critical issue in its 2011 Fact Sheet. In reaching a conclusion that evaporation associated with CCC operations would not have adverse impacts in the Hooksett Pool, EPA argues without support that the substantial, daily water loss anticipated with CCC must be similar to the evaporation rate currently experienced with Merrimack Station's open-cycle system.[668] The agency cites only to Merrimack Station's thermal discharges to baldly assert that such discharges "probably increase[] evaporation rates from the Hooksett Pool itself."[669] These unsubstantiated statements by the agency are not true. In reality,

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[666] *Id.* at 29 (internal citations omitted).

[667] Enercon 2017 Comments at 17.

[668] AR-618 at 163.

[669] *Id.*

it is generally recognized within the industry that CCC technologies "consume 70-90% of the water they withdraw as opposed to an open-cycle system[s] which discharge nearly 100% of the water they withdraw."[670]

Enercon estimated in its 2012 report that approximately 4.79 MGD would be lost due to evaporation from the Hooksett Pool if CCC is installed at Merrimack Station.[671] This equals the consumption of approximately 3,325 gallons of water per minute and approximately 2,640 Olympic-sized swimming pools per year.[672] The amount of water lost to evaporation due to PSNH's current thermal discharges and spray module system in its discharge canal pales in comparison. This is partially due to the fact that the power spray modules spray effluent into the air to cool the water through the process of convection—not evaporation—and because the modules are operated only under certain seasonal thermal conditions. Thus, in response to EPA's 2011 Fact Sheet, Enercon acknowledged that "[t]here is an incremental increase in the amount of evaporation that occurs within the Hooksett Pool as a result of elevated water temperatures" but noted that this evaporation is properly attributable to naturally occurring heat transfer due to higher ambient water temperatures within the waterbody.[673] Enercon concluded its critique of EPA's self-serving dismissal of this water consumption issue in the 2011 Fact Sheet by stating:

> [W]hile the exact amount of additional evaporation loss that occurs is difficult to determine, it is known that more water loss occurs in a closed-cycle system using cooling towers than one using a cooling pond . . . [and that] closed-cycle systems evaporate 2 to 3 times more water than open-cycle systems. This negates the

[670] Enercon 2017 Comments at 12-13.

[671] *See* AR-864 at 17.

[672] *See id.*

[673] *Id.*

> possibility that the evaporation occurring in the river due to increased temperatures exceeds that of cooling towers.[674]

In its 2017 report, Enercon provides the following additional cautionary note to convince EPA this water consumption issue deserves a greater level of concern:

> A survey of State Water Managers across the United States designated New Hampshire as one of the more concerning states with respect to expected water shortages. The increased frequency of water shortages is only compounded by increased population growth and a need for more water and electricity. In these circumstances, it is possible that plants retrofitted with closed-cycle cooling may need to return to open-cycle cooling operation for water conservation purposes.[675]

In the end, it is clear EPA's consideration of this water consumption issue in its 2011 Fact Sheet was inadequate, arbitrary and capricious and must be revisited if the agency erroneously elects to require installation of CCC at Merrimack Station to satisfy § 316(b)'s BTA standard.

d. Increased Air Emissions, as well as Fogging and Icing Associated with CCC Offset any Purported Environmental Benefit of the Technology

40 C.F.R. § 125.98(f)(ii) requires EPA to consider the "[i]mpact of changes in particulate emissions or other pollutants associated with" CCC. EPA's assessment of this issue essentially consists of a conclusory assertion that significant air emissions are not anticipated but that air pollution control laws would adequately control such emissions were they to occur.[676] Through its extensive knowledge and experience with CCC technologies, Enercon knows air emissions would be increased at the facility both through increased stack emissions and new air emissions from the cooling towers.[677] Enercon explains:

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[674] *Id.* (internal citations omitted).

[675] Enercon 2017 Comments at 13.

[676] *See* AR-618 at 156-59.

[677] *See* Enercon 2017 Comments at 14-15.

> Although the content of the stack emissions would be unaffected, the quantity would increase if closed-cycle cooling were to be implemented due to increased parasitic losses resulting from the cooling tower's electricity demands, reduced efficiency of the turbine and condenser due to warmer condenser water, and increased coal consumption to make up for the newly incurred operational efficiency losses.
>
> There would also be an increase in air emissions resulting from the operation of new cooling towers. Cooling towers are known air emitters that are subject to regulatory air pollution controls. Although EPA dismisses particulate emissions as a serious concern because high quality drift eliminators were specified in the preliminary design, even state-of-the-art drift eliminators still allow some drift to occur. It is estimated that approximately 2,880 gallons of water a day would escape the tower via drift. As a result, it is possible that additional water treatment equipment would have to be installed for any cooling tower to be operated and/or permitted, which could lead to significantly increased costs.[678]

Enercon also notes that EPA inadequately assessed potential icing/fogging concerns associated with CCC in its 2011 Fact Sheet and that this issue is, in fact, "a safety concern that requires a rigorous analysis."[679] Formation of a cooling tower plume decreasing visibility around the facility, "black ice" forming on nearby roads and highways during Winter, damages to vegetation in the vicinity of Merrimack Station, "degradation of the Station heating, ventilating, and air conditioning (HVAC) systems, increased corrosion on Station equipment, and ice accumulation on electrical equipment which could lead to electrical arcing," are all mentioned as possible effects of CCC operations.[680] In fact, Enercon suggests EPA utilize or request a

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[678] *Id.* at 15-16 (citations omitted).

[679] *See id.* at 16.

[680] *See id.* (citations omitted). Notably, icing concerns are a non-water quality environmental impact that undercuts and/or works against EPA's 2011 decision that installation and year-round operation of CCC is required to satisfy BAT for thermal discharges from Merrimack Station. *See* 33 U.S.C. § 1314(b)(2)(B) (requiring EPA to consider, among other things, non-water quality environmental impacts (including energy requirements) in rendering a BAT determination for thermal discharges). Each of the non-water quality environmental impacts discussed in Part III.E.3. of these comments therefore applies equally to critique EPA's § 316(a) BAT determination for Merrimack Station. Enercon provides the following additional discussion regarding icing concerns associated

comprehensive modeling program (such as SCATI) to adequately assess these anticipated icing/fogging impacts.[681]

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with CCC technologies in climates similar to New Hampshire, especially for plants that undergo frequent start-ups and shutdowns:

> Icing is a primary concern for cooling tower systems operating in freezing conditions, particularly those with frequent startups and shutdowns. Excessive icing can be mitigated through proper maintenance of the cooling tower system; however, final mitigative measures are often left to operator action. Of the mechanical draft designs, induced draft cooling towers are more capable of mitigating icing concerns than forced draft designs; this is largely because induced draft designs inherently pass heated air over the mechanical components, reducing their icing risk (Reference 12.15, Page 7). However, even induced draft cooling towers can build unacceptable levels of ice within the tower, beginning with air inlet louvers and heat transfer fill. This ice build-up can challenge the structural design of the cooling tower if appropriate and timely operator action is not taken to mitigate the icing effect. This presents a significant risk and challenge to the operators and additional costs to the plant (Reference 12.15).
>
> Frequent plant startups and shutdowns during freezing conditions only further complicate and increase the icing risk. During shutdown periods, the cooling tower system would need to be winterized to address the risk of complete freezing of the water basin. Winterization could be accomplished through a number of options including full system draining, installation of a bypass system to ensure that basin water does not stagnate, or installation of a basin heating system. However, these options add additional engineering design costs, construction/maintenance costs, and/or required additional operator actions at the Station for a period when there is no requirement for entrainment control (Reference 12.16, Pages 6-7).
>
> In addition to icing of the cooling tower itself, additional concerns exist for fogging and icing of the surrounding area due to the cooling tower plume. The persistency of cooling tower plumes is typically much greater in the winter due to the decreased air temperature and air moisture capacity. Plumes can present visibility issues downwind of the tower due to fogging and localized freezing/icing concerns as entrained water freezes out of the air onto roads, powerlines, and other equipment.
>
> Lastly, there are other maintenance, reliability, and safety issues associated with frequent cooling tower startups and shutdowns, regardless of the concurrent weather. Transients are introduced during each startup and shutdown of the cooling tower equipment which may subject the equipment to excessive mechanical vibration which can degrade plant equipment and present additional maintenance and capital costs for the plant (Reference 12.17, Page ii). Under freezing conditions, ice that has formed on the cooling tower fan blades can be thrown through the air for several minutes upon startup, creating the potential for damage to the surrounding equipment. Additionally, deposits and bacterial growth that form during periods of inactivity must be monitored and remediated before startup. Left unattended, these deposits and bacterial growths can degrade the cooling tower efficiency, damage plant equipment, and in some cases, endanger the health and safety of the plant employees and public (Reference 12.17, Pages 3, 19, and 26; Reference 12.18, Page 6; Reference 12.19, Pages 2 and 10). Growth of Legionella bacteria is of particular concern with cooling tower operation as Legionella bacteria are ubiquitous in aqueous environments, including the recirculating water of cooling towers. If not properly maintained, all 50 species of Legionella can potentially become pathogenic (Reference 12.18, Page 2). Once again, these maintenance and operator requirements present additional risk, challenges, and costs to the Station which would be incurred throughout the life of the plant, including those periods when there is no requirement for entrainment control.

Enercon 2017 Comments at 78-80.

[681] *Id.* at 16.

Enercon's discussions of the air emissions and icing/fogging issues reveals that EPA needs to reconsider the cumulative effects of CCC technologies. These anticipated issues clearly offset supposed benefits of the technology and could lead to increased water treatment costs. The agency's discussion of this issue in its 2011 Fact Sheet is paltry. A thorough and reasoned assessment of these issues is now mandatory pursuant to the final § 316(b) rule, meaning EPA must address them prior to attempting to classify CCC as BTA for Merrimack Station.

IV. The Compliance Schedules Proposed in the Statement for Installing CCC or Wedgewire Screens at Merrimack Station Are Not Reasonable

The compliance schedules set out in EPA's Statement for the design, permitting, construction, and tie-in of CCC[682] and wedgewire screens[683] at Merrimack Station are fatally flawed. Schedules such as these are not appropriate at this stage in the permit renewal process. Instead, it is prudent to establish compliance schedules such as these after EPA has rendered its final permit for the facility, the parties have had the ability to negotiate potential resolutions, and administrative and legal appeals (if any) have been fully exhausted. Only then can the permit writer and permittee fully appreciate the scope of the project that will be required and the factual circumstances and constraints at the facility that may complicate the schedule for the construction and tie-in of all retrofitted technologies. Events in the recent past demonstrate that the layout of an electric generating facility can drastically change in a short period of time. Accordingly, a construction compliance schedule developed at this juncture will likely be rendered obsolete by the time it is time to actually take steps to commence construction at the facility.

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[682] *See* AR-1534 at 27-28.

[683] *See id.* at 30-32.

Nevertheless, PSNH has provided comments on the key aspects of the proposed compliance schedules EPA has set out in its Statement. Should EPA erroneously reject PSNH's recommendation that such schedules are more appropriately established much later in the permit renewal process, PSNH encourages EPA to revise its schedules based on the comments below.

A. The CCC Compliance Schedule Should be Eliminated or, at a Minimum, Substantially Overhauled

CCC is not needed at Merrimack Station for the reasons articulated in these comments. A schedule for the system's installation at the facility, like the one EPA sets out in the Statement, is therefore not necessary. In addition, it is short-sighted, premature, and highly speculative for EPA to concoct a compliance schedule for a needless, extraordinarily costly technology without the detailed input of engineers familiar with the site and plant operations. Given the certainty of a multi-year appeal process of a final permit requiring conversion to CCC, coupled with the likelihood that additional changes could occur at the facility during this timeframe, a proper compliance schedule cannot reasonably be established until after the appeals process is fully resolved—and only then with insight from an engineering firm familiar with all aspects of Merrimack Station's site and operations. Nevertheless, PSNH sets out below as examples some of the more significant problems with the schedule currently proposed by EPA in its Statement, in the event the agency erroneously requires installation of this cost prohibitive technology and includes a detailed compliance schedule in the Final Permit.

Part 1.c. of the proposed compliance schedule must be revised. The six months EPA allocates for the permittee to solidify a final design required to convert Merrimack Station's Unit 1 and 2 from open-cycle cooling to CCC is woefully inadequate.[684] Since the conceptual design

[684] *Id.* at 27.

for CCC was provided to EPA in 2007, a new FGD system has been constructed.[685] The FGD system is occupying the space intended for routing new piping in the 2007 design. Therefore, the conceptual design, including cost and scheduling, must be reexamined. In order to redraft the design, PSNH needs at least sixteen months, which was the amount of time set out in the construction schedule provided to Region 1 in Enercon's 2007 report.[686]

Furthermore, will EPA first require the permittee to submit a preliminary design for the CCC technology for EPA approval? Such a requirement is included in the proposed compliance schedule for the installation of wedgewire screens.[687] If so, the timeframe within which the permittee is required to complete a final design and engineering for CCC cannot be tied to the effective date of the permit and, instead, must be tied to the date EPA approves the preliminary CCC design.

EPA has also failed to establish any period of time for PSNH to execute construction contracts necessary to commence the next phase of the project. If EPA intends to approve the permittee's final design and engineering submittal, a minimum of 12 months from the date of the agency's approval should be delineated in the schedule to allow the permittee to prepare requests for proposals, accept and review them, and negotiate a contract. More time could possibly be needed given the size, scope, and limited land constraint issues at Merrimack Station. If EPA does not intend to approve the permittee's final design and engineering submittal, a minimum of 12 months from the date the permittee issues this submittal should be provided in the schedule.

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[685] *See* AR-6.

[686] *See* AR-6 at Attachment 7.

[687] AR-1534 at 31-32.

The Part 1.d. deadline is also problematic.[688] If EPA intends to approve the preliminary CCC design, this Part 1.d. deadline also must be tied to that agency action. And, irrespective of this approval issue, the proposed nine months from the effective date of the Final Permit to complete submission of all necessary federal, state, and local permit applications are arbitrary and capricious, given it is a mere three months after the final design and engineering for the CCC technology will be completed. This necessarily means the permittee will be required to complete the overwhelming bulk of the work to complete all necessary federal, state, and local permit applications within a span of three months. More time is needed and PSNH suggests a minimum of eight months from the date a final CCC design is completed to finish this task.

Parts 1.f. through 1.j. of EPA's proposed compliance schedule exceed the scope of the agency's authority under the CWA insofar as the provision permits EPA to insert itself into the managerial and/or operational functions of the permittee.[689] At most, the agency can set a deadline by which the permittee may have the CCC technology in operation, but it is properly left to the permittee's discretion as to how it elects to meet that deadline. Interim requirements—such as when the permittee must commence construction—are unrealistic since construction is inherently fluid and subject to delay. For example, is the permittee required to commence construction in the middle of winter with snow on the ground if its nine-month deadline is approaching?[690] All of these proposed deadlines should be deleted.

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[688] *Id.* at 27.

[689] *Id.* at 27-28.

[690] The proposed requirement in Part 1.g. to plan an outage with ISO-New England by a certain date in the year prior to the anticipated tie-in date for CCC for each unit is particularly overreaching. *Id.* at 28. Merrimack Station has been online since 1960 and plant operators are well-versed in handling operations and knowing what needs to be accomplished in order to construct new technology at its facility. Therefore, requirements of this kind are unnecessary and should not be delineated in the Final Permit, as the permittee can ultimately handle such matters without EPA expending its time and resources to micromanage the construction. These tasks are vital to the completion of the overall project, and therefore, they will be completed without arbitrary deadlines.

Other issues likely exist in this proposed schedule. Unfortunately, these are the only ones PSNH is capable of identifying at this stage in the process.

PSNH maintains that requiring CCC at Merrimack Station to satisfy CWA §§ 316(a) or (b) would be arbitrary and capricious. If EPA ignores the comprehensive and well-reasoned facts and analyses submitted by PSNH and its consultants and ultimately requires CCC technologies at Merrimack Station, a reasonable compliance schedule can only, in actuality, be set following the exhaustion of all administrative and legal appeals and only then in conjunction with an engineering firm familiar with all aspects of Merrimack Station's site and operations.

B. The Wedgewire Screen Compliance Schedule Is Unworkable

The schedule for the design, permitting, construction, and tie-in of wedgewire screens at Merrimack Station must also be revised.[691] The proposed schedule set out in EPA's Statement includes the following key deadlines:

> Preliminary and final design: Provide a preliminary design of the wedgewire screens to be installed to EPA within six (6) months of the effective date of the permit and submit a final design to the agency within two (2) months after receipt of correspondence from EPA approving the preliminary design.
>
> Permits and approvals: Commence the process of obtaining necessary permits and approvals within four (4) months of submitting a final design to EPA.
>
> Construction contract: Execute an engineering, procurement, and construction agreement with a contractor within four (4) months of submitting the final design.
>
> Commissioning of wedgewire screens: Complete site mobilization and modifications, installation, tie-in, testing and commissioning of the wedgewire screens and all other technologies for the CWIS of Units 1 and 2 no later than sixteen (16) months of obtaining all necessary permits and approvals.[692]

[691] *See id.* at 30-32.

[692] *See id.* at 31-32.

PSNH takes issue with these proposed deadlines. EPA's attempt to require the permittee to enter into any construction contract exceeds the scope of the agency's authority under the CWA and is illegal *per se*. At most, EPA may set a deadline by which the permittee must have the CWIS technology in operation. How a permittee elects to ensure it will meet that deadline is left entirely to its discretion and the agency's attempt to insert itself in the managerial and/or operational functions of the permittee is inappropriate. Furthermore, this deadline is more appropriately tied to the date on which the permittee obtains the necessary permits and approvals it needs to commence construction, rather than to the submission of the final design.

Other deadlines EPA has proposed are patently unreasonable or are tied to or triggered by events or occurrences that should be adjusted. Prudent construction schedules mandate that certain deadlines are tied to the date of final permit issuance, while others must be tied to EPA's approval of a final design for the wedgewire screens or the date all necessary permits and approvals have been obtained. The following is a schedule and timeline that is sensible and would be reasonable if the permittee is ultimately forced to install the entrainment technology at Merrimack Station:

EVENT	TIME (including a description of the event to which the time is tied)
Effective Date of the Permit	0 mo[693]
Other Data Collection and Preliminary Design Submission: Time to collect additional data EPA has delineated in the Statement, including but not limited to topographic and bathymetric surveys, geotechnical exploration, and other design and marine construction variables,[694] and time to submit a preliminary design of the wedgewire screens to EPA	9 mo from the date of Final Permit issuance
Final Design Submission: Time to generate and provide a final design for the wedgewire screens at Merrimack Station based on all data collected.	3 mo from the date the permittee receives correspondence from EPA approving the preliminary design[695]
Permits and approvals: Complete submission of all necessary permit applications and notices required to install the wedgewire screens at Merrimack Station.	6 mo after EPA approves final design
Commissioning of wedgewire screens: Complete site mobilization and modifications, installation, tie-in, testing and commissioning of the wedgewire screens and all other technologies for the CWIS of Units 1 and 2.	18 mo after obtaining all necessary permits and approvals, in order for the permittee to first install the screens for Unit 1, test, monitor, and develop lessons learned, and then install the screens for Unit 2[696]

These are the only dates EPA can definitively establish in the Final Permit for Merrimack Station.

The schedule PSNH has set out above is well-reasoned and includes the minimum amount of time the permittee would need to properly design, install, and optimize the new

[693] The commencement of this schedule may not be triggered by EPA's issuance of the Final Permit if the permit is appealed by one or more parties. Instead, this schedule would become operable once the Final Permit became effective, meaning all administrative and/or judicial proceedings that resulted in a stay of the relevant conditions of the permit have been fully exhausted.

[694] *See id.* at 31.

[695] More time could actually be required if different and/or multiple engineering and/or construction firms are involved in different phases of the construction project.

[696] In fact, more than 18 months may be needed to complete the installation and tie-in of the wedgewire screens, depending upon when the Final Permit becomes effective, because the optimal time for Enercon to commence the construction phase of the project is September due to a historically low capacity factor for Merrimack Station, coupled with slower river velocities and a lack of heavy debris in the waterbody during this time frame. *See* Enercon Technology Cost Inputs Memo at 6.

technology at Merrimack Station. Thus, if EPA requires the permittee to install wedgewire screens at Merrimack Station, the agency must substantially revise its proposed compliance schedule and craft one that is reasonable and will offer a sufficient amount of time to comply with the permit requirement.

V. The 2015 NELGs EPA Does Not Intend to Reconsider Must Be Incorporated Into the Merrimack Station NPDES Permit

Much has changed on this regulatory front since EPA issued its 2011 and 2014 Draft Permits. In 2015, the agency issued NELGs establishing uniform, technology-based standards for the steam electric power generating industry.[697] The 2015 NELGs effectively eliminate any BPJ authority the agency may have possessed in this regulatory setting. And, just recently, EPA issued a final rule stating its intent to reconsider certain effluent limitations set out in the 2015 NELGs for the BATW and FGD wastewater streams.[698]

EPA correctly notes in its Statement that it "does not have the discretion to not apply the ELGs" to the final NPDES permit for Merrimack Station.[699] Stated differently, EPA must apply the ELGs to the final permit. PSNH agrees. Set out below is an overview of the latest events pertaining to the 2015 NELGs that impact when and how the BATW and FGD wastewater streams at Merrimack Station should be regulated in the new final NPDES permit for the facility. PSNH then discusses what effluent limitations and other provisions should be included in the Final Permit for the facility for the regulation of the FGD and BATW waste streams. PSNH concludes its comments on this part of the Statement by explaining the myriad reasons why it is arbitrary and capricious for EPA to regulate NCMCWs in the manner proposed in the Statement and in the agency's 2011 Fact Sheet for the Draft Permit.

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[697] *See* 80 Fed. Reg. at 67,838.

[698] *See* 82 Fed. Reg. at 43,494.

[699] *See, e.g.*, AR-1534 at 54.

A. The Current State of the NELGs Rulemaking

The Statement's chronology of events since EPA promulgated the ELGs on November 3, 2015, is generally accurate. PSNH limits its discussion to the developments that have occurred since EPA issued its Statement for public notice and comment on August 2, 2017, because these events and actions by the agency dictate the regulation of FGD and BATW in the Final Permit for Merrimack Station.

On June 6, 2017, EPA issued a proposed rule entitled "Postponement of Certain Compliance Dates for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Source Category."[700] In it, EPA proposed for public notice and comment the stay of the compliance dates for the BAT limitations and PSES for the following wastewater streams: fly ash transport water, bottom ash transport water, flue gas desulfurization wastewater, flue gas mercury control wastewater, and gasification wastewater.[701] This rulemaking was initiated by the agency to buttress its April 25, 2017 Administrative Procedure Act ("APA") § 705 administrative stay of the same compliance deadlines, a temporary measure meant to preserve the status quo that would only remain in effect "pending judicial review" (*i.e.*, only so long as the Fifth Circuit litigation challenging aspects of the final NELGs remained a viable case and controversy).

EPA published its final version of the June 6, 2017 proposed rule in the Federal Register on September 18, 2017.[702] In it, EPA announced its intention "to conduct further rulemaking to potentially revise the new, more stringent BAT limitations and PSES in the 2015 Rule applicable

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[700] *See* 82 Fed. Reg. 26,017.

[701] *Id.*

[702] *See* 82 Fed. Reg. at 43,494.

to two wastestreams[:] FGD wastewater and bottom ash transport water[.]"[703] "[T]o preserve the status quo for FGD wastewater and bottom ash transport water until EPA completes its next rulemaking concerning those wastestreams," EPA postponed the earliest compliance dates for the BAT effluent limitations and PSES for these wastewater streams for a period of two years (*i.e.*, moved the earliest compliance date from November 1, 2018 to November 1, 2020).[704] EPA also withdrew its APA § 705 administrative stay of all of the compliance dates that had not yet passed, explaining "there is no longer any need for the Agency to maintain its prior action," given it was a temporary measure to provide EPA time to reconsider the NELGs rulemaking—and that reconsideration process is now complete.[705]

EPA postponed the earliest BAT and PSES compliance date for BATW and FGD wastewater to November 1, 2020, because the agency intends to initiate a new rulemaking to potentially revise the effluent limitations for these wastewater streams and "projects it will take approximately three years to propose and finalize a new rule (Fall 2020)."[706] The agency took this interim action in light of "the substantial investments required by the steam electric power industry to comply with the BAT limitations and PSES" for BATW and FGD wastewaters, recognizing "that certainty regarding the limitations and standards deserves prominent consideration by the Agency when these limitations and standards may change."[707] EPA further noted that "[i]f [it] does not complete a new rulemaking by November, 2020, it plans to further postpone the compliance dates such that the earliest compliance date is not prior to completion of

[703] *Id.* at 43,496.

[704] *Id.* at 43,494-95.

[705] *See id.* at 43,496.

[706] *Id.* at 43,498.

[707] *Id.* at 43,497.

a new rulemaking."[708] EPA did not change the "'no later than' date of December 31, 2023, because EPA is not aware that the 2023 date is an immediate driver for expenditures by plants . . . and EPA plans to take up the appropriate compliance period in its next rulemaking."[709] Nevertheless, it is clear from the text of the September 18, 2017 final rule that EPA does not intend for the steam electric power industry to dedicate additional resources to planning, designing, procuring, and/or installing any retrofit technologies to comply with the effluent limitations set out in the 2015 NELGs for BATW and FGD wastewaters until the agency issues its revised rulemaking in Fall 2020.

Notably, the BAT "legacy wastewater" provisions in the 2015 NELGs are not stayed or otherwise impacted by EPA's latest regulatory actions and therefore remain in full effect. This means EPA continues to be precluded from developing any BPJ-based effluent limitations for BATW and/or FGD wastewaters and "does not have the discretion to not apply the ELGs," as EPA aptly notes in the Statement.[710] The 2015 NELGs define "legacy wastewater" as "FGD wastewater, fly ash transport water, bottom ash transport water, [flue gas mercury control ("FGMC")] wastewater, and gasification wastewater generated prior to the date established by the permitting authority that is as soon as possible beginning November 1, 2018 [(now November 1, 2020 for BATW and FGD wastewaters)], but no later than December 31, 2023."[711] The 2015 NELGs specify that these BAT legacy wastewater limits apply until the applicability date set by the permit writer for the waste stream in question to meet the new, more stringent BAT limits set out in the final rule.[712] And, since the applicability dates for the BATW and FGD

[708] *Id.* at 43,498, n.6.

[709] *Id.* at 43,496.

[710] AR-1534 at 54.

[711] 80 Fed. Reg. at 67,854.

[712] *See id.*

wastewater streams now may not apply to any dischargers prior to November 1, 2020, the legacy wastewater BAT limits should be included in any final NPDES permits issued prior to EPA's forthcoming rulemaking to consider the BAT effluent limitations associated with these two waste streams.[713]

The 2015 NELGs provide that "the quantity of pollutants discharged in bottom ash transport [legacy] water shall not exceed the quantity determined by multiplying the flow of bottom ash transport water times the concentration for [Total Suspended Solids ("TSS")] listed in" the following table:[714]

Pollutant or pollutant property	BPT effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0

And, the final rule provides that "the quantity of pollutants discharged in [legacy] FGD wastewater shall not exceed the quantity determined by multiplying the flow of FGD wastewater times the concentration listed for TSS in" the following table:[715]

Pollutant or pollutant property	BPT Effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0

The VIP set out in the 2015 NELGs for the regulation of FGD wastewater also is not stayed or otherwise impacted by EPA's latest regulatory actions and therefore remains in full effect. The VIP requires facilities to comply with BAT limitations based on evaporation

713 *See* 40 C.F.R. §§ 423.13(g)(1), (k)(1).

714 *See id.* § 423.13(k)(1)(ii); *id.* at § 423.12(b)(4).

715 *See id.* § 423.13(g)(1)(ii); *id.* at § 423.12(b)(11).

technology for discharges of FGD wastewater generated on and after December 31, 2023.[716] It was originally intended to provide a dual benefit of "significant environmental protections beyond those achieved by the final BAT limitations for FGD wastewater based on chemical precipitation plus biological treatment" and "the certainty of more time . . . for plants to implement new BAT requirements . . . ."[717] This "more time" could have amounted to greater than five additional years to comply with the more stringent limitations under the 2015 NELGs.[718] This time incentive has now shrunk to three years and likely will be significantly less given EPA explicitly stated in its September 18, 2017 final rule it plans to "take up" or reconsider what constitutes a reasonable compliance period for the implementation of the agency's projected BATW and FGD wastewater BAT limits as a part of its anticipated rulemaking in 2020. In fact, an unintended situation could occur in which facilities that have opted-in to the VIP are nevertheless forced to comply with the more stringent BAT limitations based on evaporation technologies before most if not all facilities within the industry are required to comply with EPA's BAT limitations anticipated in Fall 2020, given the steam electric industry has projected it will take at least 3-4 years to plan, design, procure, and install FGD treatment technologies.[719]

[716] *See id.* § 423.13(g)(3)(i).

[717] 80 Fed. Reg. at 67,858.

[718] The more than five years of additional time to comply is based on the earliest "as soon as possible" date of November 1, 2018 compared to the VIP compliance date of December 31, 2023.

[719] *See, e.g.,* EPA, Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category: EPA's Response to Public Comments, Dock. ID EPA-HQ-OW-2009-0819-6469, Part 8 of 10, at 8-52, 8-65, 8-91, 8-108 (Sept. 2015). Hereinafter, references to this document will be cited as "NELGs Response to Comments."

Under the VIP, the quantity of pollutants discharged in FGD wastewater generated before December 31, 2023 "shall not exceed the quantity determined by multiplying the flow of FGD wastewater times the concentration listed for TSS in" the following table:[720]

Pollutant or pollutant property	BPT Effluent limitations	
	Maximum for any 1 day (mg/l)	Average of daily values for 30 consecutive days shall not exceed (mg/l)
TSS	100.0	30.0

And, the following effluent limitations apply to discharges of FGD wastewater generated on and after December 31, 2023:[721]

Pollutant or pollutant property	BAT Effluent limitations	
	Maximum for any 1 day	Average of daily values for 30 consecutive days shall not exceed
Arsenic, total (ug/L)	4	
Mercury, total (ng/L)	39	24
Selenium, total (ug/L)	5	
TDS (mg/L)	50	24

B. Regulation of FGD Wastewater in the Final Permit

In its Statement, EPA correctly notes PSNH "opted-in" to the VIP for the regulation FGD wastewater at Merrimack Station by and through a letter dated March 23, 2016.[722] That letter explains that Merrimack Station currently treats its FGD wastewater using physical/chemical treatment with an Enhanced Mercury and Arsenic Removal System as its primary wastewater treatment system ("PWWTS") and significantly reduces the volume of FGD wastewater effluent from the PWWTS using a softening, evaporation, and crystallization technology, labeled as its

[720] *See* 40 C.F.R. § 423.13(g)(3)(ii); *id.* at § 423.12(b)(11).

[721] *Id.* at § 423.13(g)(3)(i).

[722] AR-1534 at 50-51 (citing AR-1343).

secondary wastewater treatment system ("SWWTS").[723] PSNH explained the SWWTS is not currently able to achieve zero liquid discharge for various reasons and continues to require a purge stream.[724] This fact is supported by the Company's comprehensive comments to EPA's 2014 Draft Permit,[725] as well as the July 2016 Enercon report that: (1) outlines the challenges and current operational realities with SWWTS at Merrimack Station; (2) corroborates that additional time afforded by the VIP to comply with effluent limitations based on evaporation technologies is required at the facility; and (3) explains the operational and maintenance obstacles that have been overcome, giving PSNH optimism the evaporative-based effluent limitations set forth in the NELGs could be achieved by December 31, 2023.[726]

EPA also correctly notes in its Statement that, in an April 18, 2017 telephone conference between Ms. Linda Landis (Senior Counsel, Eversource) and Mr. Mark Stein (Senior Assistant Regional Counsel, EPA Region 1), in which an array of issues were discussed, PSNH indicated "that regardless of the postponement and reconsideration of other aspects of the 2015 Steam Electric ELGs [it] . . . still intends to comply with VIP requirements at Merrimack Station."[727] This conversation notably took place after EPA had taken only preliminary steps to revisit the 2015 NELGs, namely issuance of the agency's April 12, 2017 public notice of an interim APA § 705 administrative stay of the compliance dates while the agency reconsidered the rule. EPA has since issued its September 18, 2017 final rule and signaled its intent to revamp not only the BAT effluent limitations and PSES for FGD wastewater, but also the period of time industry will have to comply with the new standards, potentially undercutting one of only two incentives

[723] *See* AR-1343 at 2.

[724] *See id.*

[725] *See generally* AR-1215.

[726] *See generally* AR-1416.

[727] *See* AR-1534 at 53.

(additional time to comply) compelling participation in the VIP set out in the 2015 NELGs. As stated above, the projected timetable of EPA's reconsideration of the FGD wastewater BAT limits and industry's ability to comply with such new effluent limitations could lead to an irrational situation in which facilities that have opted-in to the VIP are actually afforded less time to comply with the more stringent BAT limitations based on evaporation technology. It therefore stands to reason that entities may want to reassess decisions to opt in to the VIP based on this dramatic change in circumstances.

Other changes have occurred since that April telephone conversation, as well. Specifically, in October 2017 Eversource agreed to sell its fossil fuel facilities (including Merrimack Station) to Granite Shore. This transaction is scheduled to be finalized later this year. As the soon-to-be new owner of Merrimack Station, Granite Shore should be provided an opportunity to assess this VIP opt-in decision once the corporate transaction with Eversource is final and the company is able to be fully briefed on the regulatory and operational wastewater history at the facility. Granite Shore may determine the VIP regulatory option remains the best one for the facility despite the shift in the regulatory landscape. However, given the VIP was established as an incentive-based program and one of the primary incentives—the certainty of more time—will likely be undermined by EPA's contemplated actions, it is only reasonable that Granite Shore be provided an opportunity to independently assess the situation at the appropriate time. The company may have the ability to do so prior to EPA issuing the final NPDES permit for Merrimack Station. Should that not be the case, however, PSNH respectfully requests that the agency include the following VIP-based effluent limitations in the final NPDES permit along with what is commonly referred to as a "reopener clause," which provides EPA the flexibility to modify the Final Permit to address any requests received from Granite Shore regarding this VIP issue:

1) TSS effluent limitations for FGD wastewater generated at the facility prior to December 31, 2023, equal to BPT for TSS at 40 C.F.R. § 423.12(b)(11);[728] and

2) BAT effluent limitations set out in the table following 40 C.F.R. § 423.13(g)(3)(i) for FGD wastewater generated at the facility on or after December 31, 2023.[729]

C. Regulation of BATW in the Final Permit

EPA correctly concludes in its Statement that it "will apply the [BATW] technology-based requirements that are in effect at the time of Final Permit issuance. . . . [and] anticipates including the interim BAT limits for TSS in the Final Permit for Merrimack Station's [BATW] discharges."[730] The agency should include the "legacy wastewater" BAT limits for TSS in the Final Permit for the facility due to the regulatory uncertainty with the more stringent BAT standards set out in EPA's 2015 NELGs. As explained in EPA's September 18, 2017 final rule, the agency intends to revise these more stringent BAT limitations from the 2015 Rule in a rulemaking it intends to complete within the next three years (Fall 2020).[731] EPA postponed the earliest possible compliance date of November 1, 2018, to November 1, 2020, "to preserve the status quo for . . . bottom ash transport water until EPA completes its next rulemaking.[]"[732] EPA explicitly provided in this latest rulemaking it did not change the "'no later than' date of December 31, 2023, because EPA is not aware that the 2023 date is an immediate driver for expenditures by plants . . . and EPA plans to take up the appropriate compliance period in its

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[728] *See* 40 C.F.R. § 423.13(g)(3)(ii).

[729] *See* 40 C.F.R. § 423.13(g)(3)(i).

[730] AR-1534 at 61.

[731] 82 Fed. Reg. at 43,498.

[732] *Id.* at 43,494-95.

next rulemaking."[733] The only reasonable interpretation of these collective statements is that EPA does not intend for the steam electric power industry to dedicate additional resources to attempt to comply with the more stringent effluent limitations set out in the 2015 NELGs for BATW at this time or for the BATW "dry handling" BAT effluent limitations to be included in any NPDES permits issued prior to completion of EPA's revised rulemaking.[734] Instead, regulated entities should wait to design, procure, and install whatever appropriate BATW retrofit technologies are necessary once the agency issues its revised rulemaking. Furthermore, permit writers should include only the "legacy wastewater" TSS BAT effluent limitations for BATW set

[733] *Id.* at 43,496.

[734] To the extent EPA believes, based on the current state of the 2015 NELGs, that a justification is required because PSNH seeks a compliance date beyond November 1, 2020 (*i.e.*, the earliest "as soon as possible" date), for the incorporation of the more stringent BATW BAT effluent limitations in the 2015 rulemaking despite EPA's stated intent to overhaul these standards in the foreseeable future, the discussions and points set out in PSNH's February 17, 2017 correspondence to EPA (AR-1378) explain why the Station should be permitted until December 31, 2023 to comply with those effluent limitations. PSNH's February 17, 2017 letter requested a December 31, 2022 deadline to comply with these discharge standards based on the criteria set out in 40 C.F.R. § 423.11(t). However, as explained in April 20, 2017 correspondence, PSNH has suspended work on this compliance initiative due to EPA's decision to reconsider the rulemaking and no additional work will occur on this issue until EPA finalizes its anticipated rulemaking. *See* AR-1362. This lengthy hiatus in PSNH's work was not contemplated in its projected December 31, 2022 compliance schedule and the disruption will result in the need for an additional year (if not longer) if it is ultimately required to comply with the "dry handling" BATW effluent limitations.

One of the issues with the "dry handling" BAT determination in EPA's 2015 ELGs is the disparate costs associated with the technologies capable of eliminating the wastewater discharge compared to the toxic-weighted-pound-equivalents removed from the wastewater stream. This issue is particularly relevant to Merrimack Station due to its wet bottom cyclone-fired boilers that produce slag as an end product. Slag, a stable, inert, glass-like solid compound, is created when the molten ash leaving the boiler is quenched in a tank. The associated wastewater contains few pollutants of concern compared to the sluice wastewater utilized in systems with the typical bottom ash targeted in the 2015 NELGs, which means the already disproportionate cost-benefit ratio for the industry as a whole is even worse for the slag wastewater generated at Merrimack Station. Comments will likely be submitted on this issue during the public comment period for EPA's reconsideration of the FGD and BATW effluent limitations to encourage the agency to either exempt wastewater associated with boilers that produce slag from the new BAT effluent limitation or establish a separate BAT standard for such facilities that accounts for the few pollutants of concern in the associated wastewater. Should EPA fail to address this issue, a fundamentally different factors variance (*see* 40 C.F.R. Part 125, Subpart D) for Merrimack Station will likely be sought at the appropriate time due to these unique issues.

out in the 2015 NELGs in any permits issued prior to EPA's promulgation of its new final rule.[735]

D. EPA's Proposed Regulation of NCMCW Is Arbitrary and Capricious and Ignores the Requirements of EPA's Final NELGs

Each unit at Merrimack Station has historically treated NCMCWs as a low volume waste, meaning the wastewater stream is not subject to any iron and copper effluent limitations. This is true despite the fact that iron and copper limits apply to the outfall through which this wastewater discharges (Outfall 003A) in the current NPDES permit for the facility. The iron and copper effluent limitations applicable to Outfall 003A serve only to ensure that metals are not present in any unexpected waste stream. NCMCWs should continue to be classified as a low volume waste in the new Final Permit for Merrimack Station. Indeed, this continued classification is mandatory based on the historical permitting record for the facility, as well as the contents of EPA's administrative record for this permit renewal proceeding.

Classifying and treating NCMCWs as a low volume waste (*i.e.*, not subject to any iron and copper effluent limitations), as Merrimack Station does, is standard practice for most of the industry and is also consistent with long-standing EPA guidance set forth in what is commonly referred to as the "Jordan Memorandum."[736] EPA fails to reference the Jordan Memorandum even once in its 2011 Fact Sheet for the Draft Permit. In omitting the discussion of this important document, EPA has ostensibly simplified its ultimate objective of saddling NCMCW discharges with iron and copper effluent limitations at the facility in the new Final Permit. This

[735] Although, EPA could again consider use of a "reopener clause" in the Final Permit for Merrimack Station for this BATW regulatory issue to provide it flexibility to modify the Final Permit to address and/or incorporate the requirements of the rulemaking EPA intends to finalize in 2020.

[736] *See* Memorandum from J. William Jordan, Chemical Engineer, Permit Assistance & Evaluation Division, Office of Enforcement, EPA Headquarters, to Bruce P. Smith, Biologist, Enforcement Division, EPA Region III (June 17, 1975). Hereinafter, references to this document will be cited as "Jordan Memorandum." The Jordan Memorandum is attached hereto as Exhibit 21.

failure to adequately consider the historical permitting record at Merrimack Station is arbitrary, capricious, and at odds with EPA's directives set out in the final NELGs.

EPA's BAT analysis for determining iron and copper effluent limitations for NCMCWs in the Draft Permit is arbitrary and capricious, as well. Upon information and belief, the agency has no data of isolated NCMCW discharges generated at Merrimack Station that would allow it to competently complete the required BAT determination. There is certainly no such data in the administrative record EPA has compiled for the Draft Permit. Moreover, EPA declined to establish NCMCW effluent limitations for the entire industry due, at least in part, to the fact there has never been defensible data on the constituents found in NCMCW discharges that are representative of the industry or on the cost industry would incur if more stringent effluent limitations were established for this waste stream. EPA's BAT analysis is further flawed inasmuch as it inadequately evaluates and grossly underestimates the significant costs and/or logistical problems that regulation of NCMCWs in this manner would present at Merrimack Station. Section 304(b)(2)(B) of the CWA and EPA's own regulations require EPA to take these and other factors into consideration when adopting site-specific effluent limitations. Each of these issues is discussed in detail below.

1. Relevant Legal Background

The effluent guidelines and standards for the steam electric industry are set out in 40 C.F.R. Part 423. They were promulgated in 1974, revised in 1982, and reasserted by the agency on November 3, 2015.[737] They contain BPT limits for the generically referenced "metal cleaning wastes," BAT and NSPS limits for "chemical metal cleaning wastes," and include a holding place for future BAT limits on NCMCWs. This "holding place" remains even after the

[737] *See* 39 Fed. Reg. 36,186 (Oct. 8, 1974), amended 40 Fed. Reg. 23,987 (June 4, 1975); 47 Fed. Reg. 52,290 (Nov. 19, 1982), amended 48 Fed. Reg. 31,403 (July 8, 1983); 80 Fed. Reg. 67,838 (Nov. 3, 2015) (codified at 40 C.F.R pt. 423).

promulgation of EPA's latest NELGs on November 3, 2015, within which the agency once again elected to "reserve" BAT for NCMCWs due to the fact that the agency:

> [D]oes not have sufficient information on the extent to which discharges of non-chemical metal cleaning wastes occur, . . . the ways that industry manages their non-chemical metal cleaning wastes[,] . . . [the] potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements.[738]

The term "metal cleaning waste" is defined as "any wastewater resulting from cleaning [with or without chemical cleaning compounds] any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning, and air preheater cleaning."[739] "[C]hemical metal cleaning waste" is defined as "any wastewater resulting from the cleaning of any metal process equipment with chemical compounds, including, but not limited to, boiler tube cleaning."[740] NCMCW is not expressly defined in the regulations despite the fact that the term is used in 40 C.F.R. § 423.13(f). Nevertheless, the agency has repeatedly attempted to establish a working definition of NCMCWs based on a comparison of the two aforementioned terms defined in 40 C.F.R. Part 423: "[A]ny wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds."[741]

The BPT limits for the generically defined "metal cleaning wastes" include iron and copper limits (1.0 mg/L) and TSS and oil and grease limits.[742] BAT limitations for "chemical metal cleaning wastes" are the same as the BPT iron and copper limits for "metal cleaning

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[738] 80 Fed. Reg. at 67,863.

[739] 40 C.F.R. § 423.11(d) (brackets included in original).

[740] *Id.* § 423.11(c).

[741] AR-608 at 28.

[742] *See* 40 C.F.R. § 423.12(b)(5).

wastes" (*i.e.*, 1.0 mg/L).[743] As mentioned above, there are no current BAT requirements for NCMCWs due to a lack of data regarding this waste stream.[744]

Impacting the application of these effluent limitations to the various "metal cleaning" waste streams generated by facilities within the industry is a June 17, 1975 document commonly referred to as the "Jordan Memorandum."[745] EPA used the Jordan Memorandum to clarify the limits for "metal cleaning wastes" applied only to <u>chemical</u> cleaning wastes, explaining that use of the term "metal cleaning wastes" in 40 C.F.R. Part 423 actually meant <u>chemical</u> cleaning wastes and does not include NCMCWs.[746] The memorandum was issued by Bill Jordan of the Permit Assistance & Evaluation Division of EPA Headquarters to Bruce P. Smith of Region 3's Enforcement Division in response to a May 21, 1975 letter from Mr. Smith, noting "some confusion as to what actually constitutes metal cleaning wastes" within the industry.[747] Mr. Smith specifically provided that he was "inclined to agree with . . . companies" that:

> [E]ffluent streams that result exclusively from water washing of ash found on boiler fireside, air preheater, etc. should be considered in the low volume or ash transport waste categories, while effluent streams resulting from cleaning processes involving chemical solution (acid cleaning of boilers) should be considered in the metal cleaning waste source category.[748]

However, because of the perceived "ambigu[ity]" on this issue, Mr. Smith expressly requested EPA Headquarters provide clarification as to what constitutes NCMCWs. Mr. Smith specifically

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[743] *Compare id.* at § 423.13(e) *with id.* at § 423.12(b)(5).

[744] *See id.* § 423.13(f).

[745] *See generally* Jordan Memorandum.

[746] *Id.* at 3.

[747] *See* Jordan Memorandum, Appendix IV(B) (Letter from Bruce P. Smith, Delmarva-D.C. Section, EPA Region III, to Mr. Bill Jordan, EPA Headquarters (May 21, 1975) at 5).

[748] *Id.*

suggested “Headquarters should distinguish the type of cleaning that generates metal cleaning wastes and the type of cleaning that generates low volume wastes.”[749]

The Jordan Memorandum explicitly addresses Mr. Smith’s concerns. In it, Bill Jordan explains that NCMCWs constitute “low volume” wastes and are therefore not subject to effluent limitations for total copper and total iron in metal cleaning waste. Further, the Jordan Memorandum specifies that “[a]ll water washing operations are ‘low volume’ while any discharge from an operation involving chemical cleaning should be included in the metal cleaning category.”[750]

Due to the Jordan Memorandum, iron and copper limits for “metal cleaning wastes” (meaning chemical metal cleaning wastes) were often included in permits within the industry between 1975 and 1980. At the same time, NCMCWs were classified as low volume wastes and not mentioned by name in many permits. This was to be expected, since “low volume waste” is a residual category for wastewater from all sources that do not have specific limitations.[751]

In proposed amendments to Part 423 published in 1980, EPA recognized that it “adopted a policy” as to the classification and treatment of NCMCWs by and through the Jordan Memorandum.[752] And, this “policy” from the Jordan Memorandum was reaffirmed in EPA’s final 1982 NELGs.[753] While EPA originally proposed in 1980 to reject the Jordan Memorandum for facilities that had previously relied upon it by adopting a new definition that purportedly

[749] *Id.* (emphasis added).

[750] Jordan Memorandum at 3.

[751] *See* 40 C.F.R. § 423.11(b).

[752] *See* 45 Fed. Reg. 68,328, 68,333 (Oct. 14, 1980) (to be codified at 40 C.F.R. pts. 125 and 423) (noting that “EPA adopted a policy” in the Jordan Memorandum).

[753] *See* 47 Fed. Reg. at 52,297.

"[made] clear that the 'metal cleaning waste' definition" was meant to include NCMCWs,[754] the agency ultimately succumbed to its equitable concerns regarding the Jordan Memorandum in the 1982 final rule, recognizing that "many dischargers may have relied on [the Jordan Memorandum] guidance." Thus, EPA determined that "until the Agency promulgates new limitations and standards, the previous guidance policy may continue to be applied in those cases in which it was applied in the past."[755]

EPA likewise abstained once again from establishing BAT effluent limitations for NCMCWs in this 1982 rulemaking, acknowledging both the data the agency had collected pertaining to NCMCWs "were too limited to make a final decision" and it had not sufficiently examined either "the available data on waste characteristics of non-chemical metal cleaning wastes [or] the costs and economic impacts of controlling them."[756] Thus, the Jordan Memorandum remained in effect for facilities that had relied on it following EPA's 1982 rulemaking.[757]

The latest NELGs do nothing to change how NCMCWs are regulated at facilities within the industry. In its 2013 proposed rule, EPA set out yet again to establish BAT requirements for NCMCWs equal to previously established BPT limitations for "metal cleaning wastes"[758] while preserving the status quo for those facilities historically authorized to discharge NCMCWs as a low volume waste.[759] In the final NELGs, the agency preserved the status quo for those facilities

[754] 45 Fed. Reg. at 68,333. The definition of "metal cleaning wastes" was ultimately revised in EPA's final 1982 regulations. *See* 47 Fed. Reg. at 52,305.

[755] 47 Fed. Reg. at 52,297.

[756] *Id.*

[757] *See* EPA, High Capacity Fossil Fuel Fired Plant Operator Training Program Student Handbook, EPA-453/B-94-056 (Sept. 1994) ("Since non-chemical metal cleaning is not currently specifically regulated, it is classified under low volume wastes.").

[758] *See* 78 Fed. Reg. 34,432 (June 7, 2013) (to be codified at 40 CFR pt. 423).

[759] *See, e.g., id.* at 34,436 n.1, 34,465.

that rely upon the Jordan Memorandum to discharge NCMCWs as a low volume waste. However, EPA elected to not establish BAT requirements for NCMCWs due to flawed and imprecise data.[760] The agency stated as follows regarding how NCMCWs are to be regulated within the industry going forward:

> By reserving limitations and standards for non-chemical metal cleaning waste in the final rule, the permitting authority must establish such requirements based on BPJ for any steam electric power plant discharged non-chemical metal cleaning wastes. <u>As part of this determination, EPA expects that the permitting authority would examine the historical permitting record for the particular plant to determine how discharges of non-chemical metal cleaning waste had been permitted in the past, including whether such discharges had been treated as low volume waste sources or metal cleaning waste</u>.[761]

In its Response to Comments document, the agency provided that "[b]y not revising the [NCMCW] effluent limitations and standards and not revising the definitions, <u>the final rule will not result in changes to industry operations for the specified wastestream</u>[]."[762] The only reasonable interpretation of the above-referenced statements from the agency's final rulemaking is that NCMCWs will continue to be classified as a low volume waste if they have been historically. This has been recognized as the generally accepted practice for the last 30+ years by all relevant parties (permit writers, regulated community, interested third parties, etc.), with the assistance of the Jordan Memorandum. Any other interpretation by EPA is arbitrary and capricious.

[760] *See* 80 Fed. Reg. at 67,863.

[761] *Id.* (emphasis added).

[762] NELGs Response to Comments, Part 4 of 10 at 4-324 (emphasis added).

2. In Accordance With the Jordan Memorandum and Merrimack Station's Historical Permitting Record, NCMCWs Have Been and Should Continue to Be Classified As a Low Volume Waste

As stated above, each unit at Merrimack Station has historically treated, and continues to treat, NCMCWs as a low volume waste (*i.e.*, not subject to any iron and copper limits that may exist in its current NPDES permit). This long-standing practice is consistent with the principles of the Jordan Memorandum. As explained in detail below, it is also consistent with the operative language—or lack thereof—in the NPDES permit for this facility.

Notably, NCMCWs are not expressly referenced anywhere in Merrimack Station's existing NPDES permit and its associated Fact Sheet and Response to Comments.[763] Instead, NCMCWs are subsumed in the category of low volume wastes, in accordance with applicable regulations and the principles of the Jordan Memorandum. The relevant analysis of Permit No. NH0001465 centers around a single outfall that has been given two designations: one for normal operations at the plant (Outfall 003A) and the other for operations during the time period when chemical waste from cleaning the boiler tubes enters the process waste treatment plant (Outfall 003B). Consistent with EPA's 1982 regulations, Permit No. NH0001465 includes iron and copper discharge limitations with daily monitoring for discharges from the ash settling pond during chemical cleaning operations.[764] Iron and copper discharge limitations with quarterly monitoring requirements also exist for discharges from the ash settling pond during normal operations at the plant.[765] However, the Fact Sheet for Permit No. NH0001465 provides that these limits and monitoring requirements are included solely to protect against the "possibility that copper [and iron] retained in the pond may be released at times other than chemical cleaning

[763] *See* AR-236; AR-242; Permit No. NH0001465, Response to Comments (June 24, 1992). This document is attached hereto as Exhibit 22 and, hereinafter, references to it will be cited as "1992 Response to Comments."

[764] AR-236 at 11.

[765] *Id.* at 10.

periods."[766] Such limits are not meant to, and accordingly do not, apply to any NCMCWs that are also channeled to the ash settling pond. This fact is confirmed by EPA's synopsis of Comment 8 to Permit No. NH0001465 and the agency's corresponding response:

> COMMENT 8
>
> The permittee requests that the total copper discharge limit at Outfall 003A be eliminated, *since the ELGs regulate copper discharges for chemical cleaning operations only*, and not for routine-low volume discharges from ash settling ponds, for example.
>
> RESPONSE 8
>
> *The ELGs do not establish copper limitations on low volume wastes*, ash pile runoff, or storm water runoff (components of the ash pond discharge, Outfall 003A). The maximum total copper limitation of 0.2 mg/l is being maintained in accordance with the anti-backsliding provision of 40 CFR 122.44(1). It is to be noted that . . . this discharge has shown an average total copper concentration of 0.0015 mg/l in the past two years.[767]

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[766] AR-242 at 5. The Fact Sheet associated with PSNH's existing NPDES permit for Merrimack Station only expressly explains that numeric copper limitations have been placed on discharges from the ash settling pond during normal operations to address the possibility that copper entering the pond following chemical metal cleaning operations may be released at other times. *See id.* This reasoning must apply equally to the numeric iron limitations applicable to that outfall during normal operations. It would be inconsistent to place numeric iron limits in an NPDES permit to regulate NCMCW discharges and not place such limits on copper discharges—or vice versa. The Fact Sheet substantiates this conclusion. Nowhere in the discussion of the numeric iron discharge limitations are NCMCWs mentioned. *See generally id.* Instead, only chemical metal cleaning wastes, as well as the prevalent background concentration of iron in the Merrimack River, are discussed. In fact, the Fact Sheet identifies these sources as the only two from which iron discharges may originate: "EPA concludes that iron (*whether from intake water or chemical cleaning operations*) in the slag pond discharge . . . ." *Id.* at 5 (emphasis added). Consequently, the only rational conclusion is that numeric iron limitations were included in Permit No. NH0001465 to address the possibility that iron entering the pond following chemical metal cleaning operations may be released at other times.

This fact is also confirmed by the initial Fact Sheet drafted by EPA Region 1 in 2009 as a part of the NPDES permit renewal for PSNH's Merrimack Station, which was eventually issued for public notice and comment in September 2011. *See* AR-474. With respect to the 1.0 mg/L total recoverable iron limitation included in PSNH's existing permit, EPA Region 1 provided that "[i]t is surmised the 1.0 mg/L iron limit for Outfall 003A is to limit any iron discharged from WWTP No. 1 to the Slag Settling Pond when treating metal cleaning wastes." *Id.* at 6. In other words, as explained above, a numeric iron limitation was only included for Outfall 003A (*i.e.*, normal operations), to enable PSNH and EPA to detect if and/or when residual iron concentrations originating from chemical metal cleaning wastes are discharged during normal operations. These limits were not imposed to regulate NCMCWs.

[767] 1992 Response to Comments at 4 (emphases added).

The fact that Permit No. NH0001465 only requires quarterly monitoring for iron and copper during normal operations further supports the fact that the numeric limits do not apply to discharges of NCMCWs. If these limits did apply, monitoring would likely be required once per discharge—if not more frequently—as Merrimack Station typically generates NCMCWs more often than once every quarter. In actual fact, the numeric iron and copper discharge limitations applicable to discharges during normal operations serve only as a general safeguard to check these surrogates to ensure that metals are not present in any unexpected waste stream. PSNH's historical record of no such unanticipated iron and copper discharges has allowed it to reduce the required monitoring frequency at each of its plants over time.[768]

In the end, it is clear that NCMCWs at Merrimack Station are "currently authorized without iron and copper limits," within the meaning of the Jordan Memorandum. Therefore, the analysis provided above, coupled with a thorough review of the materials provided with these comments, necessitates a conclusion that NCMCWs at Merrimack Station should be treated as low volume waste—not subject to any iron and copper limits.

3. EPA's BAT Analysis and Administrative Record are Wholly Inadequate Even If the Agency Erroneously Refuses to Continue to Classify NCMCWs as a Low Volume Waste

NCMCWs at Merrimack Station should continue to be treated as low volume wastes. Even if EPA erroneously rejects this regulatory course of action, the agency is authorized to

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[768] *See, e.g.,* U.S. EPA, Region 1, NPDES Permit No. NH0001601 and associated Fact Sheet for Newington Station (Sept. 30, 1993), attached hereto as Exhibit 23, wherein EPA discusses this safeguarding measure and explains the impact of the facility's history of compliance:

> The effluent limits for Outfall 01C are identical with those for 01A; however, the monitoring frequencies differ. For Outfall 01A the monitoring frequency in the current permit is weekly. A review of past permitting-period monitoring data, during normal operation of the wastewater treatment system; indicates treated-wastewater loading levels consistent with an efficient operation of the wastewater treatment facility. Consequently, the sampling frequency for Outfall 01A is being reduced from weekly to monthly in the draft permit.

Id., Fact Sheet at 4.

establish effluent limitations for this waste stream only after it completes a thorough BAT analysis utilizing its BPJ.[769] The BAT analysis set out in the Fact Sheet for the Draft Permit is deficient and will not pass judicial scrutiny. Indeed, EPA's half-hearted attempt at a BPJ-based BAT analysis is riddled with conclusory statements that lack substantive analysis. The information necessary to complete a defensible BPJ-based BAT analysis is simply not in the administrative record.

EPA lacks essential data regarding the makeup of NCMCW discharges at Merrimack Station necessary to identify the constituents of concern in the waste stream, much less the quantities of each. Furthermore, EPA has failed to adequately consider the changes in current processes employed at Merrimack Station, as well as the costs necessary to achieve these changes, that would be required to comply with new effluent limitations applicable to this waste stream. Thus, the agency has no way of knowing whether its proposed effluent limitations are reasonable and/or cost-effective.

Because the agency's current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious, EPA cannot legally impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station.

a. Conducting a Legally Adequate BAT Analysis

To conduct a legally-defensible BAT analysis in accordance with § 304 of the CWA, EPA must first identify "available" technologies by "survey[ing] the practicable or available pollution-control technology for an industry and assess[ing] its effectiveness."[770] Once identified, EPA must evaluate the following factors for each technology to determine which

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[769] *See* 80 Fed. Reg. at 67,863.

[770] *Nat'l Wildlife Fed'n v. EPA*, 286 F.3d 554, 561 (D.C. Cir. 2002) (quoting *E.I. du Pont de Nemours & Co. v. Train*, 430 U.S. 112, 131 (1977)).

constitutes BAT: the age of equipment and facilities involved; the process employed; the engineering aspects of the application of various types of control techniques; process changes; the cost of achieving such effluent reduction; and non-water quality environmental impacts (including energy requirements).[771] EPA also must consider "[t]he appropriate technology for the category or class of point sources of which the applicant is a member, based upon all available information" and "[a]ny unique factors relating to the applicant."[772] No one factor is determinative; instead, EPA must balance all of the factors in determining BAT.

EPA's analysis of the BAT factors and its determination that the corresponding effluent limitations are economically and technologically achievable must be reasonable.[773] EPA ultimately bears the burden of demonstrating a reasonable basis for its conclusions that the chosen effluent limitations are achievable and a failure to do so renders the limitations arbitrary, capricious, and "not the result of reasoned decisionmaking."[774] Effluent limitations simply will not pass muster if they are "based on a flawed, inaccurate, or misapplied study."[775] Likewise, EPA is required to do more than merely make assumptions without any analysis supporting such claims. A failure to evaluate any one of the aforementioned BAT factors,[776] and/or demonstrate the effectiveness of the chosen BAT,[777] automatically renders EPA's BPJ-based effluent limitations arbitrary and capricious.

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771 40 C.F.R. § 125.3(d)(3)(i)-(vi).

772 40 C.F.R. § 125.3(c)(2)(i)-(ii).

773 *See BP Exp. & Oil v. EPA*, 66 F.3d 784, 794 (6th Cir. 1996).

774 *Ass'n of Pac. Fisheries v. EPA*, 615 F.2d 794, 820 (9th Cir. 1980); *see Chem. Mfr's Ass'n v. EPA*, 885 F.2d 253, 265 (5th Cir. 1989); *Reynolds*, 760 F.2d at 559.

775 *Texas Oil & Gas Ass'n v. EPA*, 161 F.3d 923, 935 (5th Cir. 1998).

776 *See, e.g., id.* at 934-35 (noting that a failure to consider the age of the equipment and the facilities involved when determining BAT would constitute an abuse of discretion); *Am. Iron & Steel Inst. v. EPA*, 526 F.2d 1027, 1048 (3d Cir. 1975) (remanding effluent limits because EPA did not consider the age of the facilities involved and the impact that age would have on the cost and feasibility of retrofitting older facilities).

777 *Ass'n of Pac. Fisheries*, 615 F.2d at 819; *Chem. Mfr's Ass'n*, 885 F.2d at 265.

Cost of the technology and retrofit is especially important. Indeed, the CWA specifically recognizes that BAT must be economically achievable,[778] and requires the "cost of achieving such effluent reduction"[779] to be similarly evaluated.[780] Therefore, the cost determination is two-fold: cost must be considered in the six-factor BAT analysis, and the resulting effluent limitations must be economically achievable.[781] It makes sense that cost is such an important factor in the BAT analysis because "at some point extremely costly more refined treatment will have a de minimis effect on the receiving waters."[782] Thus, EPA is authorized to "balance factors such as cost against effluent reduction benefits" and, courts have upheld EPA's decision to reject a technology based on high economic impacts that might otherwise have been the most effective pollution control technology.[783]

EPA has repeatedly contended it need not conduct a cost-benefit analysis as part of its BAT determination. Even if EPA's assertion is correct—which PSNH does not concede[784]—this

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[778] 33 U.S.C. § 1311(b)(2)(A)(i) (emphasis added).

[779] 40 C.F.R. § 125.3(d)(3)(v).

[780] *See Texas Oil & Gas Ass'n* 161 F.3d at 936 (noting cost refers to a consideration of the cost of the technology itself).

[781] *See Ass'n of Pacific Fisheries,* 615 F.2d at 819-20 (finding that EPA's failure to adequately consider the cost of land acquisition in the determination of whether a technology is an achievable technology is an example of unreasonable decision-making).

[782] *Id.* at 818; *see also Am. Petroleum Inst. v. EPA*, 787 F.2d 965, 972 (5th Cir. 1986) (providing that "EPA would disserve its mandate were it to tilt at windmills by imposing BAT limitations which removed de minimis amounts of polluting agents from our nation's waters, while imposing possibly disabling costs upon the regulated industry.") (citing *Alabama Power Co. v. Costle,* 636 F.2d 323, 360-61 (D.C. Cir. 1979) and *Appalachian Power Co. v. Train*, 545 F.2d 1351 (4th Cir. 1976)).

[783] *See e.g., BP Exp.*, 66 F.3d at 796 (rejecting a technology as BAT, in part, because of the cost of the technology).

[784] Importantly, neither does the Supreme Court. Specifically, in *Entergy,* the Court responded to a petitioner's argument that a "cost-benefit analysis is precluded under the [BAT] test" by stating that "[i]t is not obvious to us that [this] proposition is correct, but we need not pursue that point, since we assuredly [agree with other points]." *Id.* at 221-22. Likewise, Executive Order 13,563 mandates such a cost-benefit consideration on significant regulatory matters. *See* 76 Fed. Reg. 3821 (Jan. 16, 2011) (providing, in relevant part that "[o]ur regulatory system . . . must be based on the best available science . . . must promote predictability and reduce uncertainty. It must identify and use the best, most innovative, and least burdensome tools for achieving regulatory ends. It must take into account benefits and costs, both quantitative and qualitative" and that "each agency must, among other things: (1) propose or adopt a regulation only upon a reasoned determination that its benefits justify its

does not mean that cost is not important in the BAT analysis and the establishment of effluent limitations. EPA must implicitly consider the costs of the technology and the corresponding benefits received from the technology because of the duty to consider all of the factors in the BAT analysis. Additionally, the final BAT effluent limitations that are established must be economically achievable for the source.[785] In fact, the BPJ analysis requires a further step: the chosen technology must also be appropriate for point sources like the point source subject to the BPJ, based on all available information.[786] "All available information" certainly includes the costs of implementing the proposed BAT at similar facilities. Furthermore, EPA cannot solely rely on the fact that a facility or the public can "afford" a treatment technology as a basis for determining whether it is cost-effective.[787] The cost-benefit evaluation must be more than pretextual.

Once EPA determines BAT on a case-by-case basis based on its BPJ, EPA takes the technology standards established under the factors described above and applies that BAT to create actual effluent discharge limitations under § 304 of the CWA. It is through the creation of these effluent limitations that EPA imposes technology-based treatment requirements into permits.[788]

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costs (recognizing that some benefits and costs are difficult to quantify)"). Furthermore, President Trump's Executive Order 13,777 requires that each agency consider repealing, replacing, or modifying existing regulations in which the costs exceed the benefits. *See* 82 Fed. Reg. 12,285, 12,286 (Feb. 24, 2017) (providing that "[e]ach agency shall establish a Regulatory Reform Task Force . . . to evaluate existing regulations . . . and make recommendations to the agency head regarding their repeal, replacement, or modification[.]" The order requires that the Regulatory Reform Task Force at a minimum "attempt to identify regulations that [among other things] impose costs that exceed benefits[.]").

[785] *Texas Oil & Gas Ass'n*, 161 F.3d at 934.

[786] 40 C.F.R. § 125.3(c)(2).

[787] *See Seabrook*, 1977 WL 22370, at *7. If this were the case, EPA would be able to forego rigorous analyses of what technology is necessary for a particular site, and just rely on whether the owner of that facility is a Fortune 100, 500, or 1000 company ostensibly with deep pockets.

[788] *See* 40 C.F.R. § 125.3(c). EPA does not require the permittee to use this exact technology, and instead the permittee may use whatever technology it desires as long as the technology can achieve the effluent limits. *See,*

b. EPA's definition of "NCMCWs" is vague and seemingly too broad

EPA attempts to define "non-chemical metal cleaning waste" in its Fact Sheet as "any wastewater resulting from the cleaning of metal process equipment without using chemical cleaning compounds."[789] This definition lacks clarity and is overbroad. For instance, must an operator be intending to actually clean a given piece of metal process equipment for the water that comes in contact with it to constitute NCMCWs? If so, is water that incidentally contacts metal process equipment still considered a low volume waste? Furthermore, what all is included in the definition of "metal process equipment?" Will water intended to clean an electrical junction box associated with operation of the CWISs or water from an intake screen backwash constitute NCMCWs—requiring segregation and isolated chemical precipitation treatment? Interjecting subjective intent into the definition of NCMCWs is problematic and will create unnecessary confusion at the facility. Without clarity on these issues, it is not possible for PSNH to know what process changes and/or retrofits will be required to comply with the new permit.

In crafting this bloated definition of NCMCWs, EPA has ignored EPA's historical management of this waste stream and disregarded the instructive list of pieces of metal process equipment specifically referenced in the definition of "metal cleaning wastes" to serve as a guide for determining the scope of regulation for metal cleaning wastes (chemical and nonchemical) at a given facility. "Metal cleaning wastes" were first defined in the 1974 ELGs as "any cleaning compounds, rinse waters, or any other waterborne residues derived from cleaning any metal process equipment including, but not limited to, boiler tube cleaning, boiler fireside cleaning and

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e.g., *Nat'l Wildlife*, 286 F.3d at 561. However, application of EPA's chosen technology is generally the only way to achieve the effluent limitations.

[789] AR-608 at 28. Notably, the actual 2011 Draft Permit for the facility does not utilize this broad definition. Instead, it defines NCMCW effluent as "boilers water side boiler cleaning, gas side equipment ash wash, and precipitators" from Units 1 and 2 at Merrimack Station. AR-609 at 5.

air preheater cleaning."[790] For decades, EPA focused on developing data limited to chemical boiler cleaning wastes and NCMCWs associated with water washing of ash on boiler firesides and air preheaters. This makes perfect sense, given these pieces of metal process equipment are specifically referenced in EPA's definition for the waste stream. This list was presumably included in the definition for a reason. Although it is not exclusive, inclusion of a representative list such as this one should be interpreted to clarify that the agency never intended for all water that comes in contact with any metal process equipment to be interpreted as metal cleaning waste. To do so renders the representative list of metal process equipment included in the "metal cleaning waste" definition semantic and meaningless.

Only recently, as a part of the 2015 ELGs, did EPA attempt to better ascertain the potential breadth of the metal cleaning waste stream and gather corresponding additional data beyond water washing of ash on boiler firesides and air preheaters. And, this effort proved fruitless, as the agency itself provided that "plants refer to the same [NCMCW] operation using different terminology" and that results of EPA's data collection efforts are "skewed" and insufficient.[791] EPA has not concerned itself with understanding the wastewater management issues that will arise at Merrimack Station by the expansive definition of NCMCWs advanced in the Draft Permit. Nor has the agency heeded the specific list of metal process equipment included in the definition of "metal cleaning wastes" and attempted to extrapolate a reasonable list of additional metal process equipment that may be included in the definition of NCMCWs at Merrimack Station. Despite the agency's lack of action, it claims in the Fact Sheet of the Draft Permit that "the annual volume of [NCMCW] water [at Merrimack Station will be]

[790] 39 Fed. Reg. at 36,205.

[791] *See* 80 Fed. Reg. at 67,863.

considerabl[y] less than the chemical metal cleaning wastewater already generated at the site."[792] Based on EPA's broad definition of NCMCW, this statement is unjustified.[793]

EPA's seemingly all-inclusive definition of NCMCWs is not supported by the administrative record and cannot pass muster without additional analysis or discussion of the costs (including infrastructure needs) and expected pollutant reductions associated with such an expansive definition. In actual fact, expanding the meaning of "NCMCWs" to water washing of process equipment other than gas-side ash removal will be expensive and of limited environmental benefit, especially if comingling is prohibited and iron and copper limits imposed. Any definition of NCMCWs should therefore be restricted to the gas-side removal of ash without chemicals. A suitable definition of "NCMCWs" would be "any wastewater from the cleaning of ash from gas-side process equipment from the boiler to the stack without chemical cleaning compounds, including boiler fireside cleaning and air preheater cleaning."

c. There is no NCMCW discharge data in the current administrative record

Central to any BPJ-based BAT determination is a keen understanding of the waste stream to be regulated. Knowledge of both the kind and quantity of constituents found within that waste stream is fundamental inasmuch as it provides the only foundation upon which to assess the costs and economic achievability of any proposed regulation of the wastewater. EPA lacks the necessary information regarding NCMCWs generated at Merrimack Station. This is so regardless of the precise definition of the waste stream advanced by the agency. Specifically, a review of the administrative record for this permit renewal proceeding reveals EPA does not

[792] AR-608 at 32.

[793] This statement is not true even utilizing a more narrow definition for NCMCW. PSNH and others within the industry generate significantly greater volumes of NCMCWs than they do chemical metal cleaning wastewater, which may be generated only one or two times during a permit cycle (at most).

possess any data analyzing isolated discharges of NCMCWs at Merrimack Station. Instead, what EPA does possess is limited data of constituents discharged through Outfall 003A, in accordance with the terms and conditions of the current permit. NCMCWs comprise only a small, relatively infrequent, and varying fraction of the total volume of wastewater discharged through this internal outfall. It is therefore improper for EPA to attempt to rely upon this data as representative of constituents found in isolated NCMCW discharges at Merrimack Station.

The reality is that currently there is no data analyzing isolated NCMCWs generated at Merrimack Station due to the fact that PSNH historically has relied upon the Jordan Memorandum and commingled this waste stream with other low volume waste streams periodically generated at the facility. PSNH never needed to analyze this isolated waste stream due to this longstanding practice; nor has EPA ever requested any analyses of isolated NCMCWs over the 50+ year life of this facility. This is true despite the agency's inexplicable attempt to alter the regulatory requirements applicable to this waste stream in this permit renewal proceeding. This data is indispensable in establishing reasoned BPJ-based BAT effluent limitations. The agency's current BAT analysis is therefore necessarily arbitrary, capricious, and "not the result of reasoned decisionmaking" given it ultimately is EPA's burden to demonstrate a reasonable basis for its conclusions that its chosen effluent limitations are achievable.[794]

Collecting a representative sample of NCMCWs at Merrimack Station could prove difficult, if not impossible, due to the current configuration and operation of the facility. EPA's supposition in the Fact Sheet that PSNH can prospectively monitor chemical and nonchemical metal cleaning wastewater for compliance with copper and iron limitations separate from other waste streams simply does not reflect reality given wastewater treatment at the facility was

[794] *See, e.g., Ass'n of Pac. Fisheries*, 615 F.2d at 820.

designed to centrally treat all wastewaters, meaning commingled treatment of NCMCWs with other low volume wastes is unavoidable.[795]

EPA has not, and indeed cannot, adequately evaluate the requisite BAT factors and establish BPJ-based effluent limitations for NCMCW discharges at Merrimack Station without representative data of isolated NCMCWs generated at the facility. The agency's attempt to do so in this permit renewal proceeding is arbitrary, capricious, and a violation of the CWA and EPA's implementing regulations.

Although not mentioned in the Statement, Fact Sheet, or the administrative record, it likewise would be improper, arbitrary, and capricious for EPA to attempt to rely upon any NCMCW data compiled by EPA for use in formulating its NELGs for the industry. This is prohibited when generating site-specific effluent limitations utilizing BPJ.[796] Furthermore, even if reliance on industry data were acceptable, the data EPA has collected over the years is of limited or no utility. EPA admits as much in its latest NELGs:

> EPA based [its 2013 NCMCWs BAT] proposal on EPA's understanding, from industry survey responses, that most steam electric power plants manage their chemical and non-chemical metal cleaning wastes in the same manner. Since then, based in part on public comments submitted by industry groups, the Agency has learned that plants refer to the same operation using different terminology; some classify non-chemical metal cleaning waste as such, while others classify it as low volume waste sources. Because the survey responses reflect each plant's individual nomenclature, the survey results for non-chemical metal cleaning wastes are skewed. Furthermore, EPA does not know the nomenclature each plant used in responding to the survey, so it has no way to adjust the results to account for this. Consequently, EPA does not have sufficient information on the extent to which

[795] *See* AR-608 at 27.

[796] *See, e.g.,* AR-746 at 5-44 through 5-47 (listing a facility's NPDES application form and discharge monitoring reports as sources of permissible information about constituents found in a given waste stream and further providing that without such data, "[t]he permit writer might need to establish a monitoring-only requirement in the current NPDES permit to identify pollutants of concern and potential case-by-case limitations for the subsequent NPDES permit renewal.").

> discharges of non-chemical metal cleaning wastes occur, or on the ways that industry manages their non-chemical metal cleaning wastes. Moreover, EPA also does not have information on potential best available technologies or best available demonstrated control technologies, or the potential costs to industry to comply with any new requirements. Due to incomplete data, some public commenters urged EPA not to establish BAT limitations for non-chemical metal cleaning wastes in this final rule. Ultimately, EPA decided that it does not have enough information on a national basis to establish [BAT] requirements for non-chemical metal cleaning wastes. The final rule, therefore, continues to "reserve" [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations did.[797]

Data from the agency's 1974 and 1982 rulemakings is also unsuitable. There was no representative or verified data of isolated NCMCW discharges in the record of the 1974 ELG rules. And, the agency's 1982 record contained only limited data on fireside washes that, if anything, demonstrated applying iron and copper limits to NCMCWs is unnecessary and would be extremely expensive, and ultimately led EPA to conclude the available "data were too limited to make a final decision" in that rulemaking initiative.[798]

These collective realities compel the conclusion that EPA lacks sufficient data on the waste characteristics of NCMCWs to adequately assess the feasibility and costs of controlling the waste stream at Merrimack Station by and through the imposition of new BPJ-based effluent limitations. Its attempt to do so in the Draft Permit without this imperative data is arbitrary and capricious. Furthermore, despite the fact that the agency refused to set BAT effluent limitations in the NELGs due to incomplete data and information, EPA is attempting here to impose BPJ-based limitations with no data. This too is arbitrary and capricious.

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[797] 80 Fed. Reg. at 67,863; *see also* NELGs Response to Comments, Part 7 of 10 at 7-179 (providing that "[b]ecause EPA lacks solid baseline information about what the current practices are, which is the foundation for assessing costs and economic achievability, as well as the other factors required to be assessed for BAT the final rule continues to reserve [BAT] for non-chemical metal cleaning wastes, as the previously promulgated regulations did.").

[798] *See* 47 Fed. Reg. at 52,297.

d. Requiring changes in current plant processes to segregate and treat NCMCWs would be difficult, if not impossible

The processes and engineering modifications suggested in the 2011 Fact Sheet are based on nothing more than unfounded assertions. EPA has not visited nor tried to visit Merrimack Station to determine whether such modifications are even plausible. If it had, it would see that current infrastructure and processes employed would need to be extensively overhauled in order to attempt to segregate and treat NCMCWs from other low volume wastes. Even then, complete segregation from other low volume waste streams prior to treatment may not be possible.[799]

EPA attempts to gloss over these operational realities by proposing that PSNH can monitor chemical and nonchemical metal cleaning wastewater for compliance with copper and iron limitations separate from other waste streams.[800] It is an unrealistic assumption that PSNH can eliminate or divert all other low volume waste streams whenever NCMCWs are being generated and treated or that the facility can divert isolated NCMCWs to another treatment process before commingling the waste stream with other low volume waste streams.[801] These abstract statements ignore the fact that Merrimack Station was specifically designed to handle and treat smaller and less infrequent waste streams, like NCMCWs, in a centralized manner for the sake of efficiency. Attempting to overhaul this decades-long practice does not take place by the push of a button or a change in operational procedure.

As currently proposed, any wash water that comes in contact with any "metal process equipment" constitutes NCMCWs, according to EPA's broad definition.[802] At Merrimack Station, this includes all wash water utilized to pressure wash boilers, air heaters, precipitators,

[799] *See* AR-608 at 31.

[800] *See id.* at 27-28.

[801] *See id.* at 31.

[802] *See id.* at 28.

and stacks, among other associated process equipment. Within the industry, the primary treatment system for wastewaters of this kind is designed to operate in a centralized manner, *i.e.*, to mix streams and manage them together in order to be efficient.[803] Merrimack Station is no different.

For instance, wastewaters from boiler blowdown, demineralizer regenerations, and floor drains (collectively considered low volume wastes) are commingled at Merrimack Station, both out of necessity and by design. Even during other shorter outages, Merrimack Station's floor drains are routinely exposed to fireside wastewater or some other nonchemical metal cleaning operation, *e.g.*, condenser and heat exchanger cleanings. Therefore, the floor drain system routinely transfers a combination of low volume wastes and NCMCWs from Merrimack Station to the treatment facility.

A mandate to manage NCMCWs separately is not currently possible at Merrimack Station since the wastewater treatment facilities were designed to centrally treat all wastewaters. Such wash waters necessarily end up in floor drains, where they are unavoidably combined with other low volume wastes. Furthermore, even if possible, segregation of NCMCWs from other low volume waste streams would be labor intensive (e.g., construction of isolated berms or other temporary containment structures so that wash water could be contained and held for treatment) and likely lead to upsets and/or recurring operational issues. Although in theory it seems plausible to operate facilities in a neat and tidy manner and ensure NCMCWs are isolated, this is just simply not feasible. PSNH's facilities are operated within the bounds of reality, which

[803] *See, e.g.,* EPA, Technical Development Document for the Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category, Dock. ID EPA-821-R-15-007, at 8-19 (Sept. 2015) ("The vast majority of plants combine some of their legacy wastewater with each other and with other wastestreams, including . . . metal cleaning wastes, and low volume waste sources in surface impoundments.").

makes it not practicable to completely segregate NCMCWs from other low volume waste streams prior to treatment.

Further complicating matters is that the infrastructure retrofits necessary to isolate NCMCWs are generally very expensive and, once installed, necessarily preclude other technologies from occupying the same space, meaning facilities have limited space in which to achieve the maximum environmental benefit from control technologies. The relative infrequency of nonchemical metal cleaning operations at Merrimack Station, the fact the metals in the waste stream settle out easily with the current wastewater treatment systems, and the substantial volume of water generated during a unit wash down (at least under EPA's expansive definition of what constitutes NCMCWs) that would need to somehow be isolated and retained, lead to only one reasonable conclusion: the investment in retrofit technology for the isolated treatment of NCMCWs cannot be justified given all other environmental regulatory initiatives requiring retrofits that compete for the same space within the facility.

Managing NCMCWs in the manner EPA has proposed in the Draft Permit will likely require the addition of a second storage facility at Merrimack Station. Unless a facility has a substantial existing footprint with copious amounts of unused real estate, which Merrimack Station does not, the most likely option to fit a storage facility would be to reclaim a section of an existing treatment system to construct new basins. This is a costly proposition and would impact the effectiveness of treatment currently provided by reducing retention time in existing treatment systems.

e. Use of a combined waste stream formula will not work at Merrimack Station

EPA advances the development of a combined waste stream formula as one potential mechanism for handling and treating NCMCWs in the manner it has proposed in the Draft

Permit.[804] The agency asserts that electing to comply with the proposed permit limitations utilizing this approach could be less expensive than making engineering modifications at the facility.[805] In reality, use of a combined waste stream for the effective treatment of NCMCWs at Merrimack Station is not practical and would likely result in the use and waste of thousands of dollars of chemical treatments not ultimately necessary to comply with the proposed iron and copper effluent limitations.

This treatment theory is impractical for numerous reasons. For starters, the respective total volumes, frequencies, and concentrations of iron and copper for NCMCWs and each of the current waste streams commingled with NCMCWs are inherently variable. No two volumes of NCMCWs are the same for equipment water washes at Merrimack Station or anywhere in the industry. EPA recognized this as part of its 2015 ELGs rulemaking: "Additionally, some wastestreams have significant variations in flow, such as metal cleaning wastes[.]"[806] Employing EPA's overly-broad definition of NCMCWs, some form of this waste stream may be generated hourly or daily most days and may be continuous for extended periods of time during a planned outage. The generating frequency and volumes of boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes currently commingled with NCMCWs at Merrimack Station likewise fluctuate a great deal depending upon plant operations and other factors.

Concentrations of iron and copper attributable to each waste stream are likewise impossible to predict or estimate with any degree of certainty and would be further compounded

[804] *See* AR-608 at 27.

[805] *Id.* at 32.

[806] 80 Fed. Reg. at 67,855.

by intake credit issues.[807] PSNH currently has no way of knowing what amount of iron and copper limits are attributable to each isolated low volume waste stream, and given the aforementioned variables, PSNH has serious doubts the concentrations of iron and copper within these isolated low volume waste streams remain consistent. Instead, it is more likely the amount of iron and copper in, for instance, NCMCWs and wastewater entering floor drains fluctuates a great deal depending upon plant and/or personnel operations.

Due to the aforementioned myriad of variables and unknowns, establishing a preset formula to effectively treat NCMCWs at Merrimack Station and ensure compliance with the proposed iron and copper effluent limitations utilizing the combined waste stream theory is not possible. Attempting to rely upon a formula such as this would cause PSNH to either over-treat the combined waste stream with excessive amounts of chemicals to precipitate out the iron and copper constituents at a significant annual cost or, conversely, subject the facility to frequent and repeated exceedances of the proposed effluent limitations due to the great degree of variability in the makeup of the combined waste stream. Neither scenario is a sensible one. The combined waste stream formula approach should therefore be disregarded as impractical for the regulation of NCMCWs at Merrimack Station.

f. EPA did not even attempt to evaluate the cost of its proposed regulation of NCMCWs

"[R]elatively modest" is the term used within EPA's fleeting discussion of the anticipated costs to comply with the regulatory requirements applicable to NCMCWs set out in the Draft Permit.[808] The agency's attempt to convert its cost-effectiveness analysis into a cursory

[807] *See* 40 C.F.R. § 122.45(g) (providing that technology-based effluent limitations shall be adjusted to reflect credit for pollutants in the discharger's intake water under certain conditions).

[808] *See* AR-608 at 32.

"affordability" determination is impermissible, wholly inadequate, and legally insufficient.[809] EPA failed to even estimate in its 2011 Fact Sheet or in the administrative record the actual monetary amount required for PSNH to comply with its anticipated regulation of NCMCWs under any of its proposed scenarios.[810] It is the agency's burden to demonstrate a reasonable basis for its conclusions that the chosen effluent limitations are achievable. More is required than its speculative and conclusory analysis here.[811] For instance, with no data on isolated NCMCWs generated at Merrimack Station and no estimates on the costs to retrofit the plant to adequately isolate and manage the wastewater, how can EPA assess the costs and incremental benefits (*i.e.*, \$/TWPE) its proposed regulatory requirements would yield? It cannot.

PSNH has never undertaken to estimate the costs associated with attempting to isolate NCMCWs at Merrimack Station. Indeed, there has never been a reason to do so given the longstanding classification of this waste stream as a low volume waste, in accordance with the Jordan Memorandum. Even without the benefit of a detailed analysis, PSNH can offer the

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[809] *See Seabrook,* 1977 WL 22370, at *7.

[810] Again, EPA cannot attempt to rely upon any data or information EPA has collected or generated as part of its recent NELGs rulemaking because the agency has stated time and again that the data pertaining to NCMCWs it has collected is insufficient and does not accurately reflect how this waste stream is handled within the industry:

> At the time of the final rule, EPA acknowledge[d] not having sufficient information to perform a nationwide BAT evaluation for non-chemical metal cleaning wastes. Information such as:
>
> - identification of potential treatment systems that represent BAT for non-chemical metal cleaning wastes;
> - cost information for BAT technologies;
> - wastewater characterization data for untreated non-chemical metal cleaning wastes; and
> - treatment system performance data for the treatment of non-chemical metal cleaning wastes.

NELGs Response to Comments, Part 7 of 10 at 7-393.

[811] *See Ass'n of Pac. Fisheries*, 615 F.2d at 820 (finding that a failure to explain and justify a BAT determination renders the resulting effluent limitations arbitrary, capricious, and "not the result of reasoned decisionmaking"); *see also* NELGs Response to Comments, Part 7 of 10 at 7-179 (providing that "the CWA requires EPA to make a reasonable assessment of costs. Without a baseline of what is the status quo, it is difficult to make a reasonable assessment of the cost of additional controls.").

following comments that adequately demonstrate that the costs required to attempt to reconfigure the facility to separately manage NCMCWs would not be "relatively modest" and, in fact, would be substantial enough to grossly outweigh whatever benefits EPA expects to arise from the isolation of this waste stream.

Ensuring that NCMCWs would never be commingled with boiler blowdown, demineralizer regenerations, floor drains, and other low volume wastes at Merrimack Station could likely require the design and installation of a collection system, supporting pumps and pipes, lined basin, and chemical precipitation treatment system capable of capturing and transporting the maximum quantity of NCMCW produced during a multi-day or multi-week outage and processing NCMCWs within a 30-day period. The estimated capital costs for modifications of this kind at facilities within the industry can range from a few million dollars to in excess of $32 million.[812] And, annual operation and maintenance costs would also likely be substantial.

EPA's belief that "these costs [associated with the required engineering modifications] are relatively modest and that PSNH can afford [them]" is vague and wishful thinking.[813] Admittedly, all things are possible with endless resources and finances. However, since PSNH does not exist in such a reality, EPA should not automatically assume that it is "feasible" for Merrimack Station to bear the total costs to comply with the regulatory requirements applicable to NCMCWs set out in the Draft Permit.

The table below, submitted by Utility Water Act Group ("UWAG") in its comments to EPA's 2013 proposed rule for the NELGs, itemizes costs actually incurred at a facility that

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[812] These monetary figures were compiled by and through a review of public comments submitted by the industry in response to EPA's 2013 proposed rulemaking for the now final NELGs. *See* EPA, Rulemaking for the Steam Electric Power Generating Effluent Limitations Guidelines, Dock. ID EPA–HQ–OW–2009–0819.

[813] *See* AR-608 at 32.

installed necessary infrastructure to capture and treat its combine low volume wastes to achieve the 1.0 mg/L copper and iron limits for NCMCW discharges with zero redundancy:[814]

Equipment/Product/Task	**Cost**
Internal & External Engineering Cost	$ 475,235
Exiting Tank Retrofits & Refurbishment - Clarifier Tank & Clean Effluent Tank (Chemical Clean Tank)	$ 1,148,568
Collection Package Civil - Collect Trenches and Wash Sump Construction; Neutralization Basin Closure	$ 1,615,712
Material & Equipment Purchases - Pump Sumps (Qty-4); Sludge Recycle Pumps (Qty-2) Sludge Disposal Pumps (Qty-2); Clarifier Conversion Internals; Rake Drive Reaction Tank	$ 2,568,508
Electrical & Control & Instrumentation Install VFDs (Qty-8); MCCs; AllenBradley PLC w/HMI; Remote I/O; Chemical Skids (Qty-2); Instrumentation (All); Cable; Conduits; Lighting	$ 1,022,971
Mechanical Install Installation of Interconnecting Piping; Supports; Reaction Tank, Clarifier Tank-Walkways-Rake-Truss	$ 1,735,273
Reaction Tank Foundation - Concrete and Steel Supports	$ 222,204
Metal Wash Startup Support/Training	$ 5,394
Metal Wash Startup Support/Training	$ 2,343
Total of Current Expenditures	$ 8,796,208
Additional Planned Improvements	$ 350,000
Planned Total Expenditures	**$ 9,145,208**

[814] Utility Water Act Group, Comments of the Utility Water Act Group (UWAG) on EPA's Proposed Effluent Limitations Guidelines and Standards for the Steam Electric Power Generating Point Source Category (40 C.F.R. Part 423), Docket ID Nos. EPA-HQ-OW-2009-0819 and EPA-HQ-RCRA-2013-0209, at 269-270 (Sept. 20, 2013). The relevant excerpt from UWAG's comments is attached hereto as Exhibit 24.

Contrasted with Merrimack Station's two generating units, the facility has three units. The facility's operator installed a metal cleaning wastewater collection system on each unit with piping directing the wastewater to a common treatment system. Solids generated in the system are sent to the facility's existing solid waste processing system. The treated effluent is sampled to demonstrate compliance prior to being piped to and mixed with the facility's low volume wastewater collection/treatment system for discharge.[815] Importantly, some of the infrastructure needed for this project was already available at the facility and only needed to be re-purposed or required repairs or modification. Had the operator not been able to reuse this equipment, use the existing solid waste processing system, and use covered areas for equipment that needed to be indoors, the capital expenditures would have been much greater.[816]

The aforementioned comments demonstrate EPA's current assessment of costs necessary to isolate and treat NCMCWs at Merrimack Station is grossly inadequate. The CWA and EPA's own regulations require a more rigorous analysis that, at a minimum, includes competently comparing the anticipated benefits and the relative cost of achieving those benefits before imposing BPJ-based effluent limitations in a permit. Had the agency undertaken such an analysis, it would have been apparent the costs associated with regulating NCMCWs in this manner grossly outweigh whatever benefits EPA expects to yield by its proposed changes to the permit for the facility.

Collectively, these comments, the administrative record, and a reasoned evaluation of the factors that must be considered in a BAT analysis, demonstrate EPA cannot impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station and the agency's

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[815] *See id.* at 269-70.

[816] See *id.* at 270.

current BPJ-based BAT determination is wholly inadequate, arbitrary, and capricious and must be revisited prior to issuing the Draft Permit as final.

4. If EPA Erroneously Elects to Impose Iron and Copper Limits on NCMCWs, It Should Allow PSNH Sufficient Time to Comply

The Draft Permit does not specify when PSNH would be required to comply with the proposed iron and copper limits for the NCMCW stream. Should the agency ultimately buck the historical handling of NCMCWs at the facility as low volume waste and impose iron and copper limits, adequate time to comply must be provided. As explained above, to comply with these new effluent limitations PSNH would have to extensively modify pipes, sumps, and treatment systems so as to collect isolated NCMCW discharges and treat them by chemical precipitation for iron and copper. The facility would also likely have to perform extensive excavation of existing sumps and piping and install new pipes and treatment tanks. This work in isolation could take two years or more to complete and could be even further complicated or prolonged due to any approvals and/or permits that may be required.

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For the reasons stated above, EPA must not—and indeed cannot based on the current permitting record—impose iron and copper effluent limitations on NCMCW discharges at Merrimack Station and should allow such wastewaters to continue to be classified as a low volume waste stream and commingled with other similar low volume waste streams.

E. Miscellaneous

1. Sensitive Test Methods Rule

PSNH has no issue with the requirements of 40 C.F.R. § 122.44(i)(1)(iv) being explicitly referenced in the Final Permit for the facility. To the extent EPA is able to do so, the phrases "known level of confidence" and "reliably measured within specified limits of precision and accuracy" should be better defined or explained in the proposed permit language to eliminate any ambiguities regarding when a particular procedure or method is satisfactory.

2. PCB Discharges

PSNH has no issue with EPA's proposed general prohibition against discharges of polychlorinated biphenyl compounds in the Final Permit for the facility. As the agency correctly points out, such a provision is included in the existing NPDES permit for the facility.[817]

[817] *See* AR-236 at 3.